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Modernization of Ayurveda: A Brief Overview of Indian Initiatives

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Ayurveda has been the main guiding force in drug discovery from traditional medicine. In concept, this system is rooted in folk or ethnomedicine and in practice it shows further refinement and development in accordance with local traditions. Isolation of active principles from crude drugs, their pharmacological evaluation, therapeutic proving and clinical application resulted in the genesis of modern or so called allopathic medicine. To keep the opportunity alive for further development in traditional as well as modern medicines, it is necessary to have an uninterrupted connection with ethnomedicine. Since the practice of ethnomedicine is based on the age-long indigenous knowledge which has been orally transmitted through generations and sustained in traditions there is an urgent need to document such knowledge. The ongoing strategies adopted in India to document the precious traditional knowledge and conserve medicinal plants are discussed in this communication. India with her rich plant wealth and traditional knowledge about the medicinal use of plants has tremendous scope to provide leadership in ensuring human health and longevity.

Keywords: Herbal remedies, AYUSH, Traditional systems, Ayurveda, Ethnomedicine, Pharmacognosy.

Herbal medicine is a general term used to include all remedies prepared from plants for use in folk or ethnomedicines and traditional (codified) systems like Ayurveda, Unani, and Siddha on one side and allopathic or modern medicines on the other [1]. The concept of folk medicines has been undergoing oral transmission through generations and survives in folk traditions, there being no documentation in texts covering pharmacy and pharmacopoeia. This system, basic to all other systems of medicine, is still in use and practiced among people of indigenous communities and also among conservative people of urban areas [2].With progress in science and philosophy of folk or ethnomedicines, emerged traditional systems are now classed as codified systems which include Ayurveda, Unani, Siddha and homoeopathy (exotic traditional in India). These systems are mostly based on medicinal plants and rooted in folk or ethnomedicine and have their characteristic principles, theory and pharmacy well documented in texts and literature of classical antiquity [2]. With further progress in medical science, especially in pharmacology and phytochemistry, researchers have started refining the entire concept of isolating and characterizing the active principles (secondary metabolites of plants). Intensive and extensive pharmacological screening, clinical evaluation, improvement of pharmacy, and therapeutic confirmation of drugs have started receiving greater commitment and concern. Pharmacognosy gained ground to prevent adulteration and ensure quality control. From these scientific developments there has emerged the allopathic system [3]. With the development of pharmaceutical chemistry many synthetic forms of natural (herbal) active principles were evolved along with many medicinally active artificial organic compounds. For these scientific credentials allopathic medicines earned enormous global appreciation and acceptance, especially in the urban areas and modern societies. However, the allopathic system has proved its inefficiency in curing many refractory diseases and has been inducing drug resistance in pathogens, causing drug-induced diseases and deranging the general health of the users [4]. It is not merely the high price, but the fear of the detrimental side effects which has forced health conscious people to opt for alternative systems of medicine.

Contemporary thoughts: There has been a tremendous rejuvenation of interest in herbal remedies during the last few decades throughout the world, especially among health conscious people of modern societies for their patient friendly nature and for being palliative, prophylactic and immuno-modulatory in function with excellence in antioxidant virtues. Efficacy of herbal medicines in curing even otherwise incurable refractory diseases is no longer under doubt [4]. Resistance in pathogens to antibiotics induced by their frequent and irrational use and the detrimental side effects of modern medicines have raised several eyebrows and resulted in aversion towards them [5]. Recent advances in molecular and biochemical pharmacology and aromatherapy have popularized herbal remedies to a large extent [6]. Moreover, the relatively lower price of herbal medicines has enabled a larger section of the people to use them. It appears presently that people in every society are acquainted with the benefits obtainable from plants, especially for sustaining health and improving the quality of life. According to WHO, 3.5 billion people in developing countries use plant based medicines for their primary health care [5]. Approximately half of the drugs currently in clinical use are products of natural origin [7].

Ayurveda: "Ayurveda" is a Sanskrit word resulting from the synthesis of two words: ayus, meaning 'life', and veda, meaning 'related to knowledge' or 'science'; so that it literally means the 'science of life' [6]. Dhanwantari Deva, considered to be a reincarnation of Lord Vishnu, was the guiding sage of this science

or knowledge of healing in India, which has its mention in one of the oldest (about 6,000 years) philosophical texts of the world, the "Rig Veda". As mentioned in the Rig Veda, it consists of three aspects (the Tri-Sutras of Ayurveda), which are etiology or the science of the causes of disease, the study and interpretation of symptoms and medication. Approximately, during 4,000 to 3,000 BC, Sam Veda and Yajur Veda, the second and third Vedas came into existence. Between 3,000 and 2,000 BC Atharva Veda the fourth of the series was received of which Ayurveda is an Upaveda (subsection). Though its adoption and application has a much longer history in India, it was codified from the oral tradition to book form, as an independent science during this period (3000-2000 BC). Under Ayurveda came such disciplines as "Kaya chikitsa" (internal medicine), "Shalkya Tantra" (surgery and treatment of head and neck, ophthalmology and otolaryngology), "Shalya Tantra" (surgery); "Agada Tantra" (toxicology), "Bhuta Vidya" (psychiatry), "Kaumarabhritya" (pediatrics), "Rasayana" (science of rejuvenation or anti-aging), and "Vajikarana" (the science of fertility). Though Ayurveda came into being as an independent Upaveda of Atharva Veda, it has a close relationship with other Vedas also. The *Yajur Veda* is related to Ayurveda in its principles and regulations of lifestyle in the sense that it recommends rituals to pacify the *panchamahabhuts,* to heal both the cosmic being and the individual soul. The *Upaveda*, *Dhanur Veda* or the martial art and Ayurveda both come close to each other in the treatment of 'marmas' or sensitive points in the body [8].

Around 1500 BC, Ayurveda was ramified into two distinct schools: Atreya-the School of Physicians, and Dhanwantari-the School of Surgeons. This made Ayurveda a more systematically classified medical science. These two schools of thought led to the writing of two major books on *Ayurveda-Charaka Samhita* and *Susruta Samhita*, which were written in the early part of 1000 BC by the great sage-physicians Charaka and Susruta, respectively. *Susruta Samhita* was based on the Dhanwantari School of thought and comprises knowledge about prosthetic surgery to replace limbs, cosmetic surgery including rhinoplasty, caesarian operations and even brain surgery. Around 500 AD, *Vagbhatt* compiled the third major treatise on Ayurveda, *Astanga Hridaya*, which included the perspectives of both the schools of Ayurveda. From 500 AD to 1900 AD, sixteen major *Nighantus* or supplementary texts on Ayurveda were written to include novel drugs, expand applications, discard old drugs and identify the substitutes [9].

Ayurveda, being holistic in approach, is not only a well-documented system of medicine, but also a way of life to prevent and cure diseases. The most fascinating aspect of Ayurveda lies in the fact that almost all methods of healing, lifestyle regimen, yoga, aroma, meditation, exercises, bodywork, use of gems, amulets, color, herbs, diet, application of "Jyotish" (astrology), and surgery are used in restoration of health in patients. It is based on drug discovery using reverse pharmacology i.e., drug materials are first identified based on ethnic uses and then validated through clinical trials. It is a system of medicine integrating harmoniously with the body, environment, mind and spirit and is based on no less than 7000 plants and about 8000 remedies, which have also been codified [4]. About 850 species of plants are used in ethnoveterinary practices (EVP) in India [10]. This Indian system of medicine had its promotional influence in the past on different traditional systems of the world, and presently has been invigorating its acceptability and use in developing as well as developed countries of the world [11].

AYUSH: The Government of India set up the independent Department of Indian Systems of Medicine and Homoeopathy (ISM&H) under the Ministry of Health and Family Welfare in March 1995. This department was renamed in November, 2003 as the "Department of Ayurveda, Yoga and Naturopathy, Unani, Siddha and Homoeopathy (AYUSH)" with a view to provide focused attention on the development of education and research in these traditional systems. Prior to this, a national policy was formulated in 2002 for promoting the growth and development of traditional systems. The Department continues to lay emphasis on the up grading of AYUSH educational standards, quality control and standardization of drugs, improving the availability of medicinal plant materials, research developments and awareness generation about the efficacy of the system domestically and internationally. WHO has been collaborating with the Government of India in promoting and strengthening activities in standardization, quality control and use of Traditional Medicines. The WHO, India, in collaboration with the Central Drugs Standard Control Organization (CDSCO), the Department of AYUSH, Ministry of Health and Family Welfare, Government of India, Research Councils, National Medicinal Plants Board and other organizations in the area of Essential Drugs and Medicines (EDM) addresses the issues of access, quality, safety and rational uses of medicines (both allopathic and traditional medicine drugs). Traditional practices that have existed for thousands of years, as has been realized, should exist today collaterally with modem medicine. Presently, health systems all over the world have to cope with the changing environment: epidemiologically, in terms of changing age structures, pollution, the impact of pandemics, and the emergence of new pathogenic threats. With the country's several building capacity strategies between 2006-2011, more and more normative programs on traditional medicine are being supported *inter alia* for promoting safe, rational and quality assured use of AYUSH remedies with capacity building of institutions and documentation [12].

Documentation of Indian Indigenous Knowledge (IK) regarding medicinal plants and their uses (non-codified traditional systems): About 300 million people i.e. 1 in every 20 on the Earth belong to an indigenous culture. Nearly half of them live in Asia, mostly in China and India. In India the ethnic communities are called "tribes". India has nearly 68 million people belonging to 576 indigenous communities designated as scheduled tribes. These communities, belonging to 227 ethnic groups and 427 Scheduled Tribes, still live in forests and have profound knowledge about the uses of bioresources [13]. It is comprehensively evident that India has an enormous indigenous knowledge, especially in medicinal plants for curing various diseases [14 -16]. This has raised the interest of the corporate world for profitable acquisition and given a jolt to India to arouse consciousness about her own knowledge wealth. There is an urgent need to document all ethnobotanical information among the diverse ethnic communities before the traditional cultures are completely lost. Moreover, after the Rio Convention in 1992 and the implementation of the GATT to save the intellectual property and indigenous knowledge of the tribal communities of a country, it is essential to explore its ethnic knowledge in different parts of India. Since this knowledge transmits orally through generations and survives in traditions of indigenous societies, there is an immediate need to document such facts, which are rapidly fading away, to avoid the knowledge becoming either victim of biopiracy or becoming extinct. India has started giving its best efforts to establishing the claim on traditional cures since she discovered cases of biopiracy after an antifungal product derived from the native neem plant *(Azadirachta indica* A. Juss.) received a patent in Europe in 1994, and a turmeric-based *(Curcuma longa* L.) cure was patented in the United States in 1995. India has successfully had both patents revoked after long struggles [17].

A database, jointly owned by the Council of Scientific and Industrial Research (CSIR) and India's Ministry of Health and Family Welfare (Government of India), has been set up to dissuade foreign companies from patenting traditional medicines. The searchable database, thus created, covers more than 230,000 formulations after scouring ancient texts on Indian systems of medicine, Ayurveda, Unani, Siddha and Yoga, in Hindi, Sanskrit, Arabic, Persian and Urdu. The database is also available in English, Japanese, French, German and Spanish. The European patent examiners can now access India's massive database on traditional remedies in order to ensure that patents are not granted for treatments already used in Indian Systems of Medicine. Some of the pertinent websites from India and abroad are listed below.

Department of AYUSH, http://www.indianmedicine.nic.in/, Ayurvedic foundations http://www.ayur.com , Siddha Medicine http://www.siddhaquest.com , Naturopathy, Herbal, Accu-pressure and Ayurvedic Services -dir.indiamart.comlindianservicesl buds.html, Central Council for Research in Homoeopathy: http: www.ccrhindia.org, Sanjeevani -Asia's largest Yoga and Naturopathy Institution http://www.sanjeevaniindia.org/, Herb Society(UK): http://www.sunsite.unc.edu/herbmed/herbSociety, Herbal Remedies Information: www.herbalremediesinfo.com, Herbal Remedies: www.herbalremedies.com, Medicinal Plants Network: http://www.medplant.net, Medicinal Plants Global Network: http://bellanet/medplants, International Council for Medicinal and Aromatic Plants: http:// www.icmap.org, Phytochemical and Ethnobotanical database: http:// www.ars-grin.gov/

Tasks ahead in India: Provision of good health to all is collaterally important with escalation of life standards for which TM is ideal. As such, topmost priority should be given to the provision of traditional health services, creation of general awareness of herbal medicines, and their popularization. Moreover, projects on promotion of cultivation of judiciously selected species of medicinal plants having compatibility with the prevailing agro-climate should be implemented to reduce depletion of these phyto-resources. This can serve to enhance the production of Traditional Medicines so as to serve the huge populace, a major portion of which live well below the poverty level and in villages with no access to modem medical facilities.

Vast stretches of drought prone areas and wastelands prevailing in the country could be reclaimed with the cultivation of certain medicinal and aromatic plants which shall certainly yield ecological as well as economic welfare.

The progressively increasing interests in herbal medicines, food supplements, cosmetics, insecticides, germicides, soap, preservatives, herbal antibiotics, tonics and aromatherapy throughout the world have been very encouraging for the developing countries, especially those which are rich in biodiversity. India, with her rich biodiversity and advanced biotechnology, has a very bright prospect to convey the benevolence from the plant-world to mankind in areas of herbal pharmaceuticals and nutraceuticals.

Present status of Ayurveda in the global scenario: Traditional medicine can be considered as a solid amalgamation of dynamic medical know-how and ancestral experience [18]. Among the different Traditional Systems of Medicines it is Ayurveda which has been regaining its past glory and gaining strong acceptance among the western community. The indigenous knowledge about medicinal plants, well documented in Ayurvedic literature, has been positively responding to scientific needs (evaluations for validation). People in the East and West, WHO and UNESCO have taken keen interest and resolved to promote this Indian Traditional System of Medicine on a global basis. The knowledge of the Great sage Charak has led to the discovery of many important drugs of the modern age [8,16]. The countries which have shown special interest in the Ayurveda curriculum and research include Argentina, US, Japan, Australia, South Africa, Netherlands, UK, France, Italy and Russia. The government of Russia has entered into an understanding with the Indian Government in the field of Ayurveda training and research. *Panchkarma* and *Kshar Sutra* were given official recognition in Russia. Similarly, South Africa had accepted Ayurveda as a medical system and registered all Ayurvedic doctors and started graduate and post-graduate courses. The Nelson Mandela School of Ayurveda has also been set up. Gujarat Ayurveda University has signed MoUs for collaboration in the field of education and research with institutions in Japan, Australia, Italy and Argentina. A major initiative has also been taken with joint collaboration with the National Institute of Health, US. This clearly speaks of the acceptance of Ayurvedic and allied systems by the US as scientific systems.

Conclusion: The current global health sector trends suggest that medical pluralism, to which Indian traditional medical systems can contribute critically, will shape the future of health care. This shift from singularity to plurality is taking place because it is becoming increasingly evident that no single source of health science has the capacity to contribute solutions to all of societies health needs. India has a comparative advantage to be a world leader in the era of medical pluralism because it has strong foundations in evidence based biomedical sciences, as well as an immensely rich and complex indigenous medical heritage of its own. The government has undertaken and encouraged several initiatives in the area of traditional medicine within the country and the Department of AYUSH in the Ministry of Health has been creating support programs with science and technology agencies including CSIR, ICMR (Indian Council of Medical Research), DBT (Department of Biotechnology) and DST (Department of Science and Technology). IAIM-FRLHT (Institute of Ayurveda and Integrative Medicine & Foundation for Revitalization of Local Health Traditions) has developed the nation's most comprehensive, multi-disciplinary databases on flora, fauna, metals and minerals associated with Indian traditional remedies. In 1995, the IAIM-FRLHT initiated establishment of the first internationally accredited herbarium of medicinal plants of India with a commitment to expand further to set up repositories of fauna, metals and minerals used in the Indian system of medicines [19]. Attempts need to be launched to promote IK in MPs through botanical knowledge and knowledge based on policies of biodiversity conservation, global health and development. To escalate the momentum the National Knowledge Commission (NKC) has given important recommendations to promote the knowledge systems of traditional medicines. Establishment of a National Mission on Traditional Health Knowledge (NMTHK) has been emphasized for taking up these tasks in an organized fashion. However rapprochement and compatibility need to be maintained between traditional and modern systems. An earlier review of our research group in this journal highlights the different aspects of ethnopharmacological drug discovery [20]. With a view to globalize as well as mobilize research in Ayurveda, a strong research force in the name of the "*Pharmacognosy and Phytotherapy Research Group*" was established. Some of the primary objectives of the group are: (i) dereplication studies on traditionally used medicinal plants for the search of potent bioactive compounds; (ii) research on medicinal plants that have been used for obesity and diabetes in the

Indian/Australian/Chinese traditional medicines for further chemical and pharmacological study; (iii) identification of biomarkers in the selected plants using LC-MS and studying the effects of these biomarkers on new therapeutic targets for obesity and diabetes such as peroxisome-proliferator-activated receptors (PPARs); (iv) documentation of threatened, endangered, unexplored medicinal plants in eastern India; (v) to create databases for identification and authentication of materials with well-defined botanical and phytochemical characteristics; (vi) to create standard protocols for establishing purity of materials, identification of adulterants, substitutes and heavy metal residues in traditionally used medicinal plants; (vii) development of polyherbal formulations for diabetes and stability studies; (viii) understanding synergy between components of a medicinal plant that have been described at a molecular level giving emphasis to the biomarker concepts apart from well understood chemical marker concepts; and (ix) development of green, ecofriendly extraction methods for botanicals. In this regard our research group has worked upon many traditionally used medicinal plants (with leads from Ayurveda) with special emphasis to drug discovery for lifestyle diseases. A holistic approach using bioassay guided isolation techniques has been applied in most of the cases. Some excellent work on Ayurvedic medicinal plant research can be easily cited from the Scopus database via a search by authors name and affiliation. We constantly, through our research outputs and reviews, are trying to make researchers understand and above all not to forget the roots of natural product drug discovery which lie hidden in these traditional systems of medicine.

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