Traditional medicines in drug discovery

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ABSTRACT

Drugs used in medicine today are either obtained from nature or synthetic origin. Therapeutic use of plants for the treatment of human illnesses dates back over many millennia. Evidence of their effectiveness in the diagnosis, cure and prevention of disease states exists in every culture throughout the world. Today “traditional medicine,” characterized by the use of herbs and other natural products, still remains a regular component of health care in the world. The review covered all aspects of traditional medicines and revealed that a detailed experimental as well as standardization study is required to explore the plants and their uses to treat serious complication. It is hoped that the more efficient and effective application of natural products will improve the drug discovery process.

Keywords: Natural products; traditional medicines; herbal medicines

INTRODUCTION

Traditional medicines are those medicines which have been used by local for the treatment of diseases. Today “traditional medicine,” characterized by the use of herbs and other natural products, still remains a regular component of health care in countries such as China, Japan, India, South America and Egypt. Among ancient civilizations, India has been known to be rich repository of medicinal plants. The forest in India is the principal repository of large number of medicinal and Aromatic plants, which are largely collected as raw materials for manufacture of drugs and perfumery products. About 8,000 herbal remedies have been codified in Ayurveda (1). Ayurveda literally means ‘Science of Life’, and is considered to be the traditional medicine of India. The origin of this system goes back to a far past, in which philosophy and medicine were not separated. Therefore, philosophical views have strongly influenced the Ayurvedic way of thinking. In contrast to Western science, where objective observation played a central role, the premise in Ayurveda was subjectivity: cognition of an object or phenomenon is established by individual perception. All matter is thought to be composed of five basic elements which exhibit the properties of earth, water, fire, wind and space. These elements do not exist in isolated forms, but always in a combination, in which one or more elements dominate. Traditional medicine, including Chinese medicine, Indian Ayurveda, Arabic Unani medicine and various forms of indigenous medicine, often employs medication therapies involving the use of herbs, animal parts, and inorganic materials that have been in place for millennia and developed from empirical practices over time rather than the application of theoretical principles. Traditional medicine and medication therapy that derives largely from herbal medicine constitute a highly significant component of modern medical care for most of the world’s population today. Indian Pharmacopeia recognized more than 65 plant drugs whose constituents are used in various pharmaceutical preparations (2). Large number of drugs from medicinal plants were discovered and introduced in modern Pharmacopoeias during 1850-1950, so now days there is need to search the new medicinal plants, which are pharmacologically active and having potent phytoconstituents (3). A complex progressive behavioural and physiological alteration of brain ultimately leads to wide variety of central nervous system (CNS) disorders. In addition to individual genetic factors also external influences, such as nutrition, smoking, alcohol, socioeconomic status, environmental conditions, etc. can strongly contribute to its anticipated appearance. Anxiety is one of the most common mental disorders affecting mankind. Its prevalence is increasing in recent years due to the rather tense “man’s zest to win nature” (4) i.e. the rather tense lifestyle imposed on man by the competitive and inhumane atmosphere pervading everyday life. The search for new molecules that act on the CNS and that can be used for therapeutic purposes started with several studies in the 19th century. In fact, the first drugs used to treat pathologic conditions of the CNS were based on natural resources, specifically on plants. However, studies targeting plants with this type of bioactivity represent only a very small percentage of those investigations. In a review of the existing literature, it appears that plants with molecules that produce this kind of activity are increasingly attractive targets for the development of new drugs.

Interest in traditional system of medicine

In 2005, the World Health Organization outlined its significance in terms of expenditure and use in both developing and developed countries, finding that in Africa as much as 80% of the population turned to local indigenous methods of healing, while 42% of those surveyed in the U.S. had sought out alternative or traditional forms of health care at least once (5-6). The importance of traditional medicine in the developing world and its growing popularity in industrialized countries has come to the attention of the pharmaceutical industry and the medical research community, both of which have sought to capitalize on the knowledge contained therein. In conjunction with the growing appreciation for traditional medicine, there is concurrently a renewed recognition of the potential of natural products for new drug discovery. In contrast to a recent claim that “remarkably few [plants and minerals] possess the ability to relieve disease when rigorously evaluated by the criteria of modern, evidence-based medicine,” (7) recent research in fact shows evidence of the promise of natural products for providing prototypes for new drugs. Indeed, Newman and Cragg’s in-depth survey of the sources of new drug discovery over the past 25 years indicates that the vast majority of new drugs have resulted from the isolation and imitation of bioactive molecules of natural products. In fact, only one new drug, the antitumor compound sorfenib, has resulted from chemical synthesis through the method of combinatorial chemistry and high-throughput screening (8). The lack of expected results from this method has prompted researchers in the field to call for the further investigation and imitation of the products of “Mother Na-
Economical status of herbal and traditional medicine

During the last decade, there has been a growing interest in traditional and alternative systems of medicine in many developed countries. Medicinal plants are the oldest known health-care products. Their importance is still growing although it varies depending on the ethnological, medical and historical background of each country. Herbal medicines are assuming greater importance in the primary health care of individuals and communities in many developed as well as developing countries and there has been an increase in international trade in herbal medicines. India has 45,000 diverse plant species spread over 16 different agro-climatic zones, 10 vegetation zones, 25 biotic provinces and 426 habitats of specific species. Besides, India has up to 18,000 flowering plants, 2,500 algae, 23,000 fungi, 1600 types of lichen and 1,800 varieties of bryophytes. Of this vast amount, 15,000 to 20,000 are of medicinal value, but out of this only, 7,000 to 7,500 plants are used by traditional medicine systems in India. Public interest in natural therapies, namely herbal medicine, has increased dramatically not only in developing countries but mainly in industrialized countries. The market for ayurvedic medicines is estimated to be expanding at 20% annually. Sales of medicinal plants have grown by nearly 25% in India during 1987-96, the highest rate of growth in the world. The global trade in medicinal plants is of the order of US$ 800 million per year. Export statistics available between 1992 and 1995 indicate that India exported about 32,600 tonnes of crude drugs valued at US$ 46 million. China with exports of over 120,000 tons per annum (US$ 264.5 million) and India with over 32,000 tons per annum (US$ 46 million) dominate the international market. The annual export of medicinal plants from India is valued at Rs. 1200 million. Two of the largest users of medicinal plants are China and India. Traditional Chinese Medicine (TCM) uses over 5000 plant species, India uses around 7000. According to Export Import Bank, the international market for medicinal plant related trade is to the tune of US$ 60 billion having a growth rate of 7% per annum. China’s share in world herbal market is US$ 6 billion while India’s share is only US$1 billion. The World Bank estimated global trade in medicinal and aromatic plants and their products at US$ 5 trillion by 2050 AD. Global herbal market is around $ 70.5 billion with an average annual growth of 10-12% per annum. In European union it contributes to around 45% ($ 32 billion), rest of the Europe 4% (2.8 billion), North America 10% (7.8 billion), Asia 19% (12.2 billion) and others 7% (4.6 billion) (24).

Natural products from traditional medicine

The use of natural products with therapeutic properties is as ancient as human civilization and, for a long time, mineral, plant and animal products were the main sources of drugs (25). The Industrial Revolution and the development of organic chemistry resulted in a preference for synthetic products for pharmacological treatment. The reasons for this were that pure compounds were easily obtained, structural modifications to produce potentially more active and safer drugs could be easily performed and the economic power of the pharmaceutical companies was increasing. Furthermore, throughout the development of human culture, the use of natural products has had magical-religious significance and different points of view regarding the concepts of health and disease existed within each culture. Obviously, this approach was against the new modus Vivendi of the industrialized western societies, in which drugs from natural resources were considered either an option for poorly educated or low income people or simply as religious superstition of no pharmacological value. However, even if we only consider the impact of the discovery of the penicillin, obtained from micro-organisms, on the development of anti-infection therapy, the importance of natural products is clearly enormous. About 25% of the drugs prescribed worldwide come from plants, 121 such active compounds being in current use. Of the 252 drugs considered as basic and essential by the World Health Organization (WHO), 11% are exclusively of plant origin and a significant number are synthetic drugs obtained from natural precursors. Examples of important drugs obtained from plants are digoxin from Digitalis spp., quinine and quinidine from Cinchona spp., vincristine and vinblastine from Catharanthus roseus, atropine from Atropa belladonna and morphine and codeine from Papaver somniferum. It is estimated that 60% of anti-tumour and anti-infectious drugs already on the market or under clinical trial are of natural origin (26). The vast majority of these cannot yet be synthesized economically and are still obtained from wild or cultivated plants. Natural compounds can be lead compounds, allowing the design and rational planning of new drugs, biomimetic synthesis development and the discovery of new therapeutic properties not yet attributed to known compounds (27). In addition, compounds such as muscarine, physostigmine, cannabinoids, yohimbine, forskolin, colchicines and phorbol esters, all obtained from plants, are important tools used in pharmaceutical, physiological and biochemical studies (28). In recent years, there has been growing interest in alternative therapies and the therapeutic use of natural products, especially those derived from plants (29-31).

Traditional medicines towards the clinical existence

The basis of traditional medicine is in its use for a number of years and therefore its clinical existence comes as a presumption. However, for bringing more objectivity and also to confirm traditional claims, systematic and scientific research is necessary. In ayurvedic medicinal system, clinical experiences, observations or available data becomes a starting point which conversely in allopathic drug research comes at the end. Combining the strengths of the knowledge base of traditional systems such as Ayurveda with the dramatic power of combinatorial sciences and High Throughput Screening will help in generating of structure activity libraries. Ayurvedic knowledge and experiential database can provide new functional leads to reduce time, cost and assure safety- the three main hurdles in drug development. These records are particularly valuable since these medicines have been in common use for thousands of years (32). Plants, especially used in Ayurveda can provide biologically active molecules and lead structures for the development of modified derivatives with enhanced activity and for reduced toxicity. The small fraction of flowering plants that have so far been investigated have yielded about 120 therapeutic agents of known structure from about 90 species of plants. Some of the useful plant drugs include vinblastine, vincristine, taxol, podophyllotoxin, camptothecin, digitoxigenin, gitoxigenin, digoxigenin, tubocurarine, morphine, codeine, aspirin, atropine, pilocarpine,
capiscine, allicin, curcumin, artemesin and ephedrine among others. In some cases, the crude extract of medicinal plants may be used as medications. On the other hand, the isolation and identification of the active principles and elucidation of the mechanism of action of a drug is of paramount importance. Hence, works in both mixture of traditional medicine and single active compounds are very important. Where the active molecule cannot be synthesised economically, the product must be obtained from the cultivation of plant material. About 121 (45 tropical and 76 subtropical) major plant drugs have been identified for which no synthetic one is currently available.

1. CONCLUSIONS

Life without natural products is unimaginable. It has provided mankind with oxygen, water, fire, food, clothing, shelter and medicine. Its public health impact is considerably high, especially of traditional medicines/herbal products and nature-based modern drugs. The traditional medicines, despite its limitations, are addressing the health needs of millions of people worldwide. It is estimated that about 65-85% of the world population uses traditional medicines for their primary healthcare. Traditional medicines are increasingly getting more popular mainly because: a) it is holistic system with less side effects; b) it is evolving as an evidence-based medicine; c) its ethno-medical knowledge is applicable to modern drug discovery programs. Probably, traditional medicines could provide a solution in fighting them both as a health care delivery mechanism and as a means of chemotherapeutic pool. Knowledge of traditional medicines and their development pave a way for new drug discovery.

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