

HERBAL MEDICINE – A SAFER REMEDY?

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ABSTRACT

Herbal medicines have become more popular in recent years. Their importance and acceptability in commercial production as medicines, cosmetics and other products have increased many fold in the country and world over. However, herbal drugs industry requires constant supply of genuine crude drugs. The increasing demand of herbal drugs has led to unprecedented demand of the raw materials of herbal drugs, which are mostly collected from the wild and the supply line is adversely affected, leading to adulteration and substitution of genuine drugs. This has resulted poor quality of herbal products. Thus, it is high time to ensure quality of herbal drugs production through maintaining standards and WHO guidelines. Against this view point, present paper purports to examine microbial contamination in herbal drugs and adulteration in medicinal plants.

Ayurved is an age old, well documented system of medicine in India. This system of medicine is mostly plant based and treated the patient on an individual basis. This system of medicine has many plus points over the allopathic system, like lesser side effects and cheaper in cost etc. Although drugs are very effective and treat patients quickly in allopathic system, but they may produce some other problems. To avoid the flaws of allopathic system, ayurvedic medicines, particularly herbal medicines, have been increasingly used worldwide and have taken by all the rage during the last few decades. According to World Health Organization the present demand for medicinal plant is about \$ 14 billion a year and projected demand by the year 2050 is \$ 5 trillion. Although India has very rich biodiversity and most of the medicinal plants grow here in wild but when it comes to convert this wealth into money, it is far behind than China and Japan. Medicinal plants are usually not cultivated here, which is the main reason for being far behind than China.

An integrated approach is needed to promote export of medicinal plants from India, right from the stage of research, cultivation, collection, storage, processing and marketing in an organized manner. It is necessary to evolve a national policy in medicinal plant conservation and a nationwide network of medicinal plant nurseries. Most of medicinal plants are exploited unabatedly

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because of increasing consumer demand which results in indiscriminate harvest of wild plants. This is damaging to both ecosystems and biodiversity. There is urgent need to create greater awareness of the medicinal plants and its economic value, within and outside the country. This is especially important among government officials, farmers and scientists. Any strategy to preserve plants species will have to take people's needs and perception into account. Local users often have a good understanding of how sustainable harvesting should be practiced. In China, plant based medicine is the back bone of the health care for perhaps a billion people.

Quality, Safety and Efficacy of Herbal Medicines

Increase in popularity of herbal medicines has also brought concerns and fears over the quality, efficacy and safety of products from herbal and natural sources available in the market. Over the past decade several incidents were recorded showing adverse effects, sometimes life threatening consequential to taking herbal products or traditional medicines from various ethnic groups. For example an analysis of the Johannesburg forensic database over the years 1991-1995 revealed 206 cases in which a traditional remedy was either stated to be the cause of death or was found to be present in a case of poisoning with an unknown substance (Stewart et al., 1999). These products may be contaminated with excessive or banned pesticides, heavy metals and microbial contaminants may be related to the source of herbal medicines, if they are grown under contaminated environment or during collection of these plant materials. Chemical toxins may come from unfavorable or wrong storage conditions or chemical treatment due to storage. The presence of unrelated or wrong plant species can be related to unprofessional practice of manufacturers. Some of these environment related factors can be controlled by implementing Standard Operating Procedures (SOP) leading to Good Agricultural Practice (GAP), Good Laboratory Practice (GLP), Good Supply Practice (GSP) and Good Manufacturing Practice (GMP) for producing these medicinal products from herbal or natural sources.

Sources of Toxic Chemicals and Contaminations in Herbal Products

Toxic chemicals and contamination in herbal products may come from various sources like:

- **Environment and conditions**—Medicinal plants may be grown in the soil which already has higher concentration of toxic metals. For example Ni, Cr and Co is abundant in serpentine soils whereas Zn, Pb and Cd are high in calamine soils. Problem arises when their availability is high due to high background levels or due to human activity.

- **Conditions of drying and Processing**—Sometimes condition of drying and processing also have a role in contaminating the drugs. If drying conditions are not proper, different microbes attack the drug and deteriorate its quality.
- **Conditions of Storage and Transport**—Different chemicals are used for storing the herbal drugs to save the material from microbial contamination and mites attack. If not used properly, these chemicals also cause the contamination. During transport of these drugs, if not proper care would be taken, contamination is quite possible.

Heavy Metal Toxicity

Toxic metals comprise a group of minerals that have no function in the body and in fact are harmful. Today mankind is exposed to the high level of these metals due to industrial use and burning of coal, petroleum, and incineration of waste materials. They affect everyone and are a major cause of illness, aging and even genetic defects.

If these toxic metals present in herbal drugs, then consuming such drugs deteriorate patient's condition instead of curing them. Heavy metals become toxic when they are not metabolized by the body and accumulate in the soft tissues. The agency for toxic substances and disease registry (ATSDR) in Atlanta, Georgia in cooperation with the U.S. Environmental Protection Agency has compiled a priority list for 2001 called the "Top 20 hazardous Substances." The heavy metals arsenic, lead, mercury and cadmium appear on this list.

Arsenic—Arsenic is the most common cause of acute heavy metal poisoning in adults and is number 1 on the ATSDR's 'Top 20 list.' Arsenic is released into the environment by the smelting process of copper, zinc and lead, as well as by the manufacturing of chemicals and glasses. Arsine gas is a common byproduct produced by the manufacturing of pesticides that contain arsenic. Arsenic may also be found in water supplies worldwide, leading to exposure of shellfish, cod and haddock. Other sources are paints, rat poisoning, fungicide and wood preservatives. Target organs are the blood, kidneys, central nervous system, skin and digestive systems.

Lead—Lead is number 2 on the ATSDR's 'Top 20 list.' Lead accounts for most of the cases of pediatric heavy metal poisoning. It is a very soft metal and was used in pipes, drains and soldering material for many years. Millions of homes built before 1940 still contain lead in painted surfaces, leading to chronic exposure from weathering, flaking, chalking and dust. Every year industry produces about 2.5 million tons of lead throughout the world. Most of this lead is used for batteries. The remainder is used for cable

covering, plumbing and fuel additives. Other uses are as paint pigments and in PVC plastics, X-ray shielding, crystal glass production, pencil and pesticides. Target organs are the bones, brain, blood, kidneys and thyroid gland.

Mercury—Number 3 on ATSDR's 'Top 20 list', mercury is generated naturally in the environment from the degassing of the earth's crust, from volcanic emissions. It exists in three forms—elemental mercury and organic and inorganic mercury. Mining operations, chloralkali plants and paper industries are significant producers of mercury. Mercury compounds were added to paints as a fungicide until 1990. These compounds are now banned; however old paint supplies and surfaces painted with these old supplies still exist. Mercury continues to be used in thermometers, thermostats and dental amalgam. Medicines such as mercurochrome and merthiolate are still available. Algaecides and childhood vaccines are also potential sources. The organic form is readily absorbed in the gastrointestinal tract, lesser but still significant amounts of inorganic mercury are absorbed in the gastrointestinal tract. Target organs are the brain and kidneys.

Cadmium—cadmium is a byproduct of the mining and smelting of lead and zinc and is number 7 on ATSDR's 'Top 20 list.' It is used in nickel-cadmium batteries, PVC plastics and paint pigments. It can be found in soils insecticides, fungicides, sludge and commercial fertilizers that use cadmium are used in agriculture. 2-7% of ingested cadmium is absorbed in the gastrointestinal system. Target organs are the liver, placenta, kidneys, lungs, brain and bones.

Toxicity of these four metals is very important to study in herbal drugs because many insecticides, pesticides, fungicides and fertilizers which are used in cultivation or storage of herbal drugs contain these metals.

Pesticide Residues

WHO and FAO (Food and Agricultural Organization) set limits of pesticides, which are usually present in the herbs. These pesticides are mixed with the herbs during the time of cultivation. Mainly pesticides like DDT, BHC, toxaphene, aldrin cause serious side-effects in human beings if the crude drugs are mixed with these agents.

Microbial Contamination

Usually medicinal plants containing bacteria and molds are coming from soil and atmosphere. Analysis of the limits of *E. coli* and molds clearly throws light towards the harvesting and production practices. The substance known as aflatoxins will produce serious side-effects if consumed along with the crude drugs.

Literature Reports on the Presence of Heavy Metals, Pesticides and Microbial Contamination in Herbal Drugs

- A recent study conducted by Harvard medical school on Indian ayurvedic medicines published in the Journal of American Medical Association (JAMA) reported that ayurvedic medicines brought from about 30 South Asian stores in the Boston area had potentially harmful levels of lead, mercury and arsenic (Saper et al., 2004). These metals were found in the products like Bal Guti, Mahayograj Guggulu, Mahalaxmi vilas Ras, Safi, Shilajit etc. of some of the leading companies within ayurvedic communities. Therefore, users of these medicines may be at risk for heavy metal toxicity.
- Kneifel et al., (2002) reviewed the microbial contamination of medicinal plants and given 69 references of microbial contamination in herbal drugs.
- Koh & Woo (2000) with 58 references reported excessive toxic heavy metals in Chinese proprietary medicines in Singapore between 1990 and 1997. The names, uses, toxic heavy metals and year of detection is tabulated.
- Srivastava et al., 2000, studied the pesticide residues in herbal ayurvedic preparations and found that residues level were very low, but even their presence in herbal preparations may pose a problem with products being exported.
- Abou-Arab (1999) estimated some contaminants in commonly used medicinal plants in the Egyptian market.
- Wong et al. (1993) also reported the concentration of nine heavy metals cadmium, cobalt, copper, iron, manganese, nickel, lead, zinc and mercury in 42 chinese herbal drugs. The concentration range of the metals was comparable to that reported in many of the East Asian vegetables and fruits. Few samples contained relatively higher concentration of toxic metals such as cadmium, lead and mercury. This report suggested that the presence of heavy metals was probably caused by contamination during air drying and preservation.
- A review (Wu, 1992) with 45 references, reported studies of metabolism and toxicity of trace elements and revealed important interactions between heavy metals (Cd, Pb and Hg) and some essential trace elements such as Zn, Fe, Se, Cu, Cr and Mn. In general, a deficiency of these essential trace elements increased the toxicity of heavy metals exposure, while their deficiency may increase toxicity.

Although herbal medicines have been used for thousands of years, basic research programmes are required on the toxicity and efficacy relationship for the potent and poisonous herbal substances. To overcome the environmental factors that are related to contaminations from pesticide residues and heavy metals, there should be control measures to implement necessary standard operating procedures (SOP) for Good Agricultural Practices (GAP). Good Laboratory Practices (GLP) and Good Manufacturing Practices (GMP) are also needed to produce good quality medicinal products from herbal or natural sources. The public's belief that herbal and natural products are safer than synthetic medicines can only be ascertained by imposing regulatory standards on these products.

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