

RELEVANCE AND QUALITY CONTROL OF PLANT-BASED DRUGS IN VETERINARY PRACTICE

Dinesh Kumar, H.C. Tripathi and S.K. Tandan

Division of Pharmacology and Toxicology

Indian Veterinary Research Institute

Izatnagar-243 122 (UP).

Herbal medicines have been used in medical and veterinary practices for thousands of years in East Asian nations, particularly India. The emperor Ashok encouraged plantation of medicinal plants in his kingdom, which were useful for the human and animal diseases. This is evident from the following verse of that time in PALLI:

loZra fotra fg nsokuka fi;l fi;nkfluks euql fpdhNk p jkKksa }s fpdhNdrk i'kqfpdhNk pA
vklq<kfu p ;kfu euqlks ixkfu p ;r ;r ukfLr rr rr gkjk firkfu p jksikfirkfu pA

vFkkZr loZ= vius jkT; esa nsorkvksa ds fiz;n'khZ jtkk (v'kksd) us ekuo fpdfRik rFkk i'kqfpdRik
dh O;oLFkk dhA ekuo rFkk i'kqvksa dh mi;ksxh vkS"kf/k;kj tggj&tggj ugha Fkh] ogkj&ogkj
e;xokdj yxok;haA”

Limitations of conventional/synthetic drugs

It is now well conceived that conventional or synthetic drugs pose many serious problems, namely resistance development, residual toxicity to the end-user, toxicity to the host, unaffordable cost, non-availability in remote areas and they are not eco-friendly. In contrast to this, plant-based drugs are not toxic to the host and end-users. They are easily available, biodegradable, cheaper and eco-friendly. Moreover, the people have used them for generations. Rural folk, tribes, ethnic groups and nomads have found several plants very effective for their day-to-day problems of healthcare in livestock. In view of the above, there is an upsurge of research to develop plant-based drugs.

Indeed some medicinal plants have convincingly proved effective in various disorders following systematic modern scientific investigations. Some important examples of the active principles obtained from medicinal plants are as under:

Important plant-based medicinal compounds:

Colchicin, betulinic acid, camptothecin, topotecan, CPT-11, 9-aminocamptothecin, delta-9-tetrahydrocannabinol, beta-lappachone, lappachol, podophyllotoxin, toposide, podophyllinic acid, vinblastin, vincristin, vindesine, vinorelbine, docetaxel, paclitaxel, tubocurarine, pilocarpine, scopolamine, tropine, artemesinin, physostigmine, arecholine etc. These compounds have been commercially exploited.

Wood oil from *Cedrus deodar* has been found to be more effective in the treatment of mange in animals than the standard synthetic drugs like benzylbenzoate and tetraethylthiuram monosulphide (Lal *et al.*, 1976). Also a formulation consisting of deodar oil in combination with many plant products is claimed to be very effective in several skin diseases in dogs, pigs, cattle and poultry. Another commonly prevalent skin disease, ringworm, is effectively treated by *Cassia tora*, for which the

available synthetic drugs are costly enough. Herbal preparation consisting of *Mallotus philippinensis*, *Embelia ribes*, *Butea frondosa*, *Areca catechu*, etc., has been found very effective against intestinal worms in animals. These plants are known to be effective against helminth parasites since the time of Charak. Similarly, preparations containing *Andrographis paniculata*, *Piper longum*, *Phyllanthus niruri*, *Boeharria diffusa*, *Emblica officinale*, *Tinospora cardifolia*, etc. have been found very effective in treating liver disorders and in oxidative stress. Some formulations of *Withania somnifera* and *Asparagus racemosus* have been found effective to improve fertility in males and to improve general health of livestock. There are some indigenous medicinal plants, which prove equally effective are cheaper and safer substitutes for antibiotics. A classic example of this category is Berberine, an alkaloid from *Berberis aristata*. This drug is reported to be effective in experimental and clinical gastroenteritis, giardiasis and skin and hide diseases. This has also been reported to be effective in endometritis in cattle. Aloe compounds have been reported to work well in female functional sterility and constipation in animals. The plants *Leptadenia reticulata* and *Breynia patens* are reported to improve production in terms of milk and meat. *Nerium indicum* is an important adaptogen plant.

It is well-accepted fact that several herbal as well as conventional /synthetic drugs are being used in animals based on their use in human beings. More than 120 active principles (nicotine to taxol to artemisinin) obtained from plants are in use in some or the other diseases/ailments in human being and animals. However, in Indian context, this has not been explored well. Our medicines still contain crude forms of the drugs, which need refinement.

Herbal medicines contain either raw or processed material from one or more plants. Every plant or its part has some characterizing compound, which should be used to assure the identity or quality of a herbal medicine preparation. This characterizing compound may not necessarily be responsible for plant's biological or therapeutic value. With the increase in demand of herbal preparations worldwide, the implementation of Good Manufacturing Practices (GMP) require to be applied for the standard in the management of manufacturing processes, quality control and handling of herbal medicines. Regulation of herbal medicines can be achieved through the processes of licensing of Manufacturers, having GMP facilities. Other regulatory components could be pre-market assessment of products and post-market regulatory activity. These things are necessary in view of international (WTO) binding on quality control and for the purpose of export of medicinal plant-based drugs. The assessment of pre-market procedure depends on the risks associated with the proposed drugs and its intended use. This includes toxicity of ingredients for intended use of drug, whether to treat, cure or manage serious diseases. Its significant side effects and adverse effects from prolonged use are very important. The data on clinical or animal toxicity by the manufacturers need be supplied to the government for their use in human or animals. A standard herbal pharmacopoeia for this country has also to be prepared.

Quality control monitoring ensures the safety, efficacy of quality of herbal medicines and their preparations. Quality control consists of a regular check of the quality of medicines as per the specifications of the product, which details the requirements for identity, purity and content of characterizing compounds. The methods of testing for quality control involve macro- and microscopic examinations as the first step towards establishing the identity and degree of purity of herbal

medicines. The analytical inspection, using instrumental techniques such as, thin-layer chromatography, HPLC, GC/MASS, LC/MASS, NMR and spectrophotometry, etc. The visual inspection can be done according to the specified description of each plant/plant product. This provides the simplest and quickest means to establish identity and purity of herbal drugs. Macroscopic inspection is based on odour, colour, taste, shape, size and surface of characteristics, the microscopic examination is more important for the identification of the powdered or cut herbal medicines for quality control. Another important aspect of quality control on herbal medicines is the determination of foreign matters, including tests for hazardous contaminants, such as pesticide residues, arsenic and heavy metals, microorganisms, including aflatoxins and sulphur dioxide residues. The great difficulty in devising quality control of herbal medicines and their formulations is the inclusion of 5-15 different plants/herbs or chemical constituents in a single formulation. Further, a single herbal medicine may contain great many natural constituents. Thus, combination of several herbs results in interaction of hundreds of natural constituents. These problems limit for proximate assay methods for characterizing constituents of herbal medicines and their constituents. Therefore, characterizing constituents/chemical entities/markers/DNA fingerprints of herbal medicines and their other formulations is an important task, which should be taken up seriously by internationally community of herbalists.

Plant-based medicines are important in veterinary practice worldwide. Therefore, phytomedicines in veterinary practice have great potential as alternate medicine. However, quality control of plant-based drug formulations is costly, cumbersome and time-consuming and requires strict regulatory compliances on GMP. Therefore, experts from the field of botany, pharmacognosy, phytochemistry, clinical pharmacology and clinicians should work in a team to come out with the formulations, which should fulfill the international requirements on quality, safety and efficacy.

Further Readings:

1. Choi, D.W., Kim, J.H., Cho, S.Y., Kim, D.H. and Chang, S.Y. (2002). Regulation and quality control of herbal drugs in Korea. *Toxicology*, 181-182: 581-586.
2. Briggs, D.R. (2002). Regulation of herbal medicines in Australia. *Toxicology*, 181-182: 565-570.
3. Raviprakash, V. and Sabir, M. (1983). Scope of herbal medicines in veterinary practice. *Veterinary Research Journal*. 6: 1-9.
4. Legal Status of Traditional Medicine and Complementary/Alternative Medicine: A Worldwide Review. World Health Organization 2001.
5. WHO Traditional Medicine Strategy 2002–2005. World Health Organization 2002.
6. DNA fingerprinting in the standardization of herbs and nutraceuticals, H. Vasudevan, *Biotech Main Resource Journal*, 2005