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Ancient Indian Literature on Animal Housing and Health Corroborated by Modern Literature

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Abstract

Ancient Indian literature on animal housing and health as well as supporting evidences from modern literature were collected to prove the utility of ancient literature in modern times. Ancient literature on housing standards revealed that east facing animal house shed provides maximum comfort. The east-west orientation was recommended by a modern study. Ethnoveterinary remedies have the potential to address the health problems. Veterinary practices were developed in the West only after 10th century CE but these practices are described in the texts of Palkapya (4000 BCE), Charaka (700 BCE), and Susruta (400 BCE). Limitations of modern drug system are high cost of technology, frequent emergence of drug resistance, and environmental toxicity of drug residues. There is a major gap in the existing veterinary health care infrastructure, which is a crucial constraint in improving the livestock sector. Veterinary care reaches only 20% of livestock owners. Annual expenses on veterinary drugs and biologicals are less than ₹ 13 per livestock unit. The study proved that ancient knowledge has the capacity to serve as potential cost-effective treatment of commonly prevailing diseases of an area. Knowledge of old Indian tradition of healing will help to develop appropriate and acceptable technologies that are more suited to our farming system and animal health, and may go a long way to achieve sustainable farming and cost-effective veterinary technologies.

Sustained economic and income growth, a fast-growing urban population, and the increasing integration of global agri-food markets are fueling rapid growth in demand for animal food products in India. This implies tremendous potential for future growth of livestock sector and significant income opportunities for livestock owners, especially smallholders. Their small-scale farms and inability to comply with emerging food safety and quality standards may restrict their participation in domestic as

well as global markets (Pingali *et al*., 2005; Gulati *et al*., 2007; Mehta *et al*., 2007), but if given affordable inputs, will change the dairy as well as poultry scenario. Here comes the role of indigenous traditional information to make our animals more productive at low cost.

Animal husbandry was in much advanced stage in ancient India. Ayurveda, a branch of medicine, has been practiced in India since ages. Indian writings point to primitive medicine as having been originally learnt from observations on the activities of sick lower animals. One verse of a hymn in Atharvaveda is:

Well doth the wild boar know a plant,
The mongoose knows the healing herb,
Plants are known to the sylvan beasts.

The Vedas were the principal repositories of this early medicine system. Hymns of the oldest and most important of all the works of the Vedic literature, the Rigveda, and also of Atharvaveda, have several references indicating that the ancient people followed basic principles of animal husbandry and various prayers for the health of domestic animals.

Losses due to various ailments in animals amount to millions of rupees. Therefore, scientific methods that provide low cost animal health care need to be devised. The era of treating ethnoveterinary medicine or any other ethno-knowledge system with suspicion and labeling it as myth, superstition, and witchcraft, is bygone. China and the US governments have already taken steps to introduce indigenous knowledge based veterinary science as a part of curriculum for undergraduate veterinary science students. All three branches, i.e., veterinary acupuncture, veterinary homeopathy, and ethnoveterinary, merit inclusion as basic approaches to treat animal diseases.

Ethnoveterinary knowledge continues to be recognized at global level as a resource and boon. Of the total global alternative medical system's market of about 80 billion dollars, 50% is spent in the Orient followed by substantial amount in the Occident (WHO, 2002 – visit https://www.eda.admin.ch/content/dam/countries/countries content/india/en/resource_en_162682.pdf).

The objective of our study was to collect information on housing and disease management from Vedic period [8000–1000 BCE – editors] and Post-Vedic era up to Ashoka period [1000–100 BCE – editors], and prove that use of ancient Indian literature in modern animal husbandry is beneficial and valid as corroborated by comparing ancient literature with modern literature.

Methodology

Information has been collected from the Rigveda, Atharvaveda, *Asva-Ayurveda, Gau-Ayurveda*, Charaka Samhita, *Gaja Shastra*, *Kaushika Sutra, Taittiriya Samhita*, *Maitrayani Samhita,* Sushruta Samhita, the *Vajasaneyi Samhita*, the *Satapatha Brahmana*, the *Brihadaranyaka* Upanishads, Panini's Grammar, the Jatakas (Buddhist literature writings of Megasthenes (c. 315 BCE), Kautilya's Arthashastra (c. 300 BCE), the Ramayana, the Mahabharata,

Manu Smriti (c. 200 BCE), and the *Puranas* (c. 700 CE).

Observations and discussion

The overemphasis on the spirituality of the Indian culture has developed a common belief about the anti-scientific mentality of ancient Indian people. But the logic and reasoning, one of the basic traits of a scientific thought and a main characteristic of the Upanishads, has never been considered (Sinha, 2002). Profession of veterinary medicine is as old as the history of civilization.

Animal housing

Important instructions on animal housing in ancient literature (Krishnaswamy, 1937a, 1937b) are as follows:

- One who makes a cattle shed strong and keeps it clean from dung secures healthy growth of animals.
- Goats should never be kept in a cow shed.
- Cotton, husk, hot stearin, broomsticks, pestle, and stale food should never be kept in the cow shed.
- Cow shed should be frequently fumigated with powder of deodar (*Cedrus deodara*), asafetida (*Ferula assafoetida*), and mustard seeds.
- An asafetida tree planted near a cattle shed improves sanitation.
- East facing animal house shed provides maximum comfort.

Housing differs in various agroecological regions. Locally available low cost housing material is the most appropriate for making animal houses. The housing design depends on the environment and the animal species to be sheltered. Young and pregnant animals need special housing design. Special practices, e.g., planting of specific trees/ plants around the shelter and their benefits, etc. are region-specific.

Farmers make a bamboo basket and tie it to a branch of a tree to protect the birds from predators and water (Anthara, 2004). In Andhra Pradesh farmers make moveable goat shed with bamboo mat. The roof is made of bamboo and covered with wild grass. This housing protects goats from predators and dung falls directly on the field. Sheep and goat pens are made on farmers' fields to pen them in day/night. Bovine houses in Maharashtra are made for monsoon and winter as well as for summer. The roofs and walls are made of local material for summer and these are very suitable for the bovine in local climate (Anthara, 2004).

Thiruvenkadan *et al.* (2005) carried out a study on Kanni Adu goats in 154 households of 35 villages of southern Tamil Nadu to identify and document the rearing practices followed in the home tract. Kanni Adu goats were reared extensively as a herded group and housed only during the night. The housing pattern consisted of open pens, half-open sheds, and closed sheds. The pens/sheds were located near the dwelling of the goat owners or formed part of their residence. Farmers, when available, kept breeding bucks in the herds at all times and

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exercised no control over mating. The mean mortality rates of kid and adult were 25.8% and 1.2%, respectively.

Panigrahi *et al.* (2005) studied the effect of type of flooring on growth of goats and found that goats on cement floor had the lowest gain in weight in all age groups. Kids of 15-day age group on sand floor had the highest rate of growth and 5-month age group on cement floor had the lowest growth rate. Champak and Nagpaul (2005) studied the effect of housing systems on the growth performance of crossbred goats and revealed that the *kuccha* (mud) floor with a thatched roof shed has good practical economic significance and is also better for crossbred female kids compared to the concrete floor with a concrete roof shed. Yadav and Siddiqui (1995) reported that appropriate housing increased productivity and profit in goat farming.

Kumar *et al.* (1993) studied the microenvironment in east-west and north-south oriented sheds and its impact on physiological responses in goats in hot-dry environments. The microenvironment within a convertible shed module in east-west and north-south orientations was studied in the hot-dry period in a semi-arid zone. The east-west orientation provided a lower maximum temperature than north-south orientation. The minimum and mean daily temperature and mean daily vapor pressure was low within the shed in east-west orientation. The respiratory frequency and cardiac rate in Barbari and Jamunapari bucks housed in the shed were significantly higher in the north-south orientation than in the east-west orientation. Rate of moisture loss per unit body surface, respiratory frequency, and heart rate were significantly higher in Barbari bucks in comparison to Jamunapari bucks in sheds in both orientations. The rectal temperature did not vary due to orientation or breed. Based on these results the east-west orientation is recommended.

Sharma and Singh (2002) studied shelter seeking behavior of dairy cattle in various types of housing systems. The analysis of shelter seeking behavior revealed that uncovered manger did not discourage feeding in loose housing with central shed in summer and rainy season while it encouraged in winter. Excessive protection of closed housing resulted in considerable panting. No panting was observed in loose housing cows. At less temperature in summer and rainy season at night, open area was preferred by cows. In loose housing, tree-shade was the third preference. It can be concluded that cows were more comfortable in loose housing in summer and rainy season while in winter they were more comfortable in loose house with central shed.

Animal health

In India, veterinary science reached at the highest level during Vedic period. According to Shirlow (1941), the Ayurvedic veterinary medicine developed at the time of Atharvaveda (c. 1000 BCE) and several medicinal plants, grasses, shrubs, herbs,

etc. were used for treatment of animal diseases. Also there is need to scientifically validate these age-old practices, which were evolved by the Vedic people on the basis of their experience with nature, which they observed so closely (Swaroop, 2004).

If ancient Indian veterinary literature is used properly, veterinary profession can derive benefits for better animal health care and management in the event where modern approach tends to fail (Garg, 2002). The Ayurveda has a holistic approach to health and the causation of diseases and their treatment; hence it prescribes diet, drug, and regiment for the development of body resistance against attack of pathogens.

Identification of plants useful to man commenced in prehistoric times. The written records of Ayurveda, the ancient system of medicine in India, contain more than 8,000 herbal remedies. Charaka Samhita decribes 1,500 plants, identifying 350 as valuable medicines. Of the 45,000 flowering and non-flowering plants recognized in India, 2,000 are mentioned frequently in literature for medicinal value, and only 750 are being commonly used.

Various medicinal plants have been used in ethnoveterinary practices for reproductive disorders. Some of these are *Curcuma longa* and *Sesamum indicum* (for expulsion of retained placenta); *Murraya koenigii* (for promoting fertility in cattle); *Ziziphus nummularia* (to treat uterine prolapse), *Eclipta prostata* and *Prunus cerasoides* (to avoid miscarriage); *Ficus religiosa* (to promote conception); *Bombax ceiba* and *Chenopodium album* (to facilitate parturition in cattle); and *Grewia disperma* (to expel the dead foetus). Scientific studies have shown that *Murraya koenigii* is effective in advancing the onset of puberty in immature female rats and improving ovarian function in mature rats.

Indigenous technical knowledge (ITK) plays an important role in animal production and without proper attention the knowledge is getting lost. Practices are both positive and negative; hence a systematic exploration and analysis of ITK was taken up by Anthara (2004). Social validation of ethnoveterinary practices was attempted. There is a need to define 'best package of practices' (Anthara, 2004).

Low per capita animal production is mainly due to poor health and low key veterinary health care infrastructure, suboptimal nutrition and consequently low reproductive performance. Infrastructure for veterinary health care as well as required medicines are very important for proper animal health management. The current veterinary health care in India comprises 50,000 veterinary institutes including 7,415 veterinary hospitals, 19,791 veterinary dispensaries and 23,682 veterinary aid centers (catering to 7,000 animals/unit). Approximately one veterinarian serves around 10,000 adult cattle in today's scenario; this is a very poor ratio and is not enough to support the ambitious livestock sector development plan. There are more than 80 companies producing veterinary drugs in India. The total size of pharmaceutical industry is estimated at ₹ 2,000 crores – allopathetic drugs ₹ 1,600 crores and herbal drugs

₹ 400 crores. Despite this there is a gap in demand and supply of health care products to the tune of ₹ 7,600–10,000 million (1996 estimates). Today there is a growing popularity of herbal products for treating sick animals as more people consider plant formulations safe, eco-friendly, cost-effective, and easily accessible. If validated indigenous herbal drugs are available with farmers they can handle several common ailments cost-effectively.

Use of different herbs like *munja* (*Saccharum arundinaceum*), *shuka* (*Artemisia nilagirica*), *rajani (Curcuma longa*), *shyama* (*Ichnocarpus frutescens*), *rishbhak* (*Manilkara hexandra*), *guggula* (*Commiphora wightii*), *peepala* (*Ficus religiosa*), *ghritachi* (*Ammomum aromaticum),* etc. is mentioned in ancient literature. *Guggula*, *peepala*, *naladi* (*Arundo donax*), and *ashvagandhi* (*Withania somnifera*) can be used for treatment of drinking water and to make it disease/germ free (Atharvaveda 4:37:3).

Ethnoveterinary remedies have the potential to address some of the problems highlighted above. However, there is a need for validation and standardization of effective herbal remedies. Validation will also provide information on drug interaction and toxicity evaluation of medicinal plants, identification, and developing sources for quality raw materials, potency of medicine, variations in active principles, stringent quality control, and fulfill the need to identify disease conditions where ethnoveterinary medicines and herbal drugs can be used effectively.

Validation protocol (Anthara, 2004) involves:

- Identification of medicinal herbs.
- Searching literature for available information.
- Conducting laboratory tests.
- Extraction and identification of active principles.
- Evaluation of efficacy of herbal extracts.
- Conducting controlled clinical trials.
- Monitoring the use of remedies in the field.
- Pharma economics.

Conscientious, explicit, and judicious use of current data in taking decision about use of traditional medicine, requires integration of professional expertise with scientific evidence of efficacy and safety of trial drug (Dhawan, 2004). Specific data is required to validate traditional medicine. The following information is required before declaring any traditional medicine suitable for use:

- Efficacy evaluation
  - Pharmacological studies provide rationale for traditional use
  - Climate studies validate traditional indications
- Safety assessment: Toxicity studies guided by available traditional or experimental data
- Pharmaceutical data
  - Botanical authentications of the plant and parts

– Identification of active principle or marker
– Standardization of dosage for different diseases and animals (WHO, 1991)

The limitations of modern drug system are: high cost of technology, frequent emergence of drug resistance, and environmental toxicity of drug residues. There is a major gap in the existing veterinary health care infrastructure, which is a crucial constraint in improving the livestock sector. Veterinary care reaches only 20% of livestock owners.

Anthara (2004) surveyed the prevalent diseases/disorders in Andhra Pradesh and Maharashtra. The common diseases/ disorders prevalent in ruminants in both the states were: bloat, diarrhea, helminthes, foot rot, foot-and-mouth disease, ephemeral fever, wounds/maggot wounds, fracture, debility, eye diseases, and hematuria. Other common diseases were polygastric disorders, cough and cold, pneumonia, mange, blackquarter, and contagious ecthyma in Andhra Pradesh and anorexia, stomatitis, fever, snakebite,

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tick infestation, and HCN poisoning in Maharashtra. The animals were treated by using plants with information from farmers and no validation but with literature support. The analysis of case sheets indicated that 100% ruminants were cured in Maharashtra and 99.99% in Andhra Pradesh (Table 1). Treatment of different common diseases/ disorders of the area with these indigenous herbal drugs is cost-effective as the medicinal plants are available locally (Table 2). The study proved that ancient knowledge has the potential for cost-effective treatment of commonly prevailing diseases in the area.

Chauhan and Das (2004) studied job performance of the veterinary livestock development assistants (VLDAs). The study was conducted in the purposively selected Intensive Cattle Development Project (ICDP) of Karnal district, Haryana,

Table 1. Analysis of case sheets of ruminants.

Description	Maharashtra	Andhra Pradesh
Total no. of disease conditions documented	126	61
Disease conditions reflected for validation	18 (15%)	16 (26%)
Total no. of treatments documented	1223	1186
Total treatments documented for selected disease	161 (13%)	420 (35%)
Total ruminants treated using plants, with information	303	650
Total cured but no validation and no literature support	292 (96%)	543 (90%)
Total cases treated using plants, with information, no validation, but with literature support	739	1038
Total cured	739 (100%)	1038 (99.99%)

Table 2. Herbal treatment of some common diseases of ruminants

Disease	State	Plant species used for treatment
Bloat	AndhraPradesh	*Mangifera indica* + *Syzygium cumini* + *Azadirachta indica* + *Cocos nucifera*
	Maharashtra	*Pogostemon parviflorus*
Polygastric disorders	Andhra Pradesh	*Ailanthus excelsa*
Diarrhea	Andhra Pradesh, Maharashtra	*Phyllanthus reticulatus* + *Eleusine coracana*
Foot rot	Andhra Pradesh	*Terminalia chebula* + *Cleisthanthus collins* + *Azadirachta indica* + *Strychnos nux-vomica*
Pneumonia	Andhra Pradesh	*Azadirachta indica* + *Holarrhena antidysenterica*
Fever	Maharashtra	*Syzygium cumini*
Maggot wounds	Andhra Pradesh	*Ximenia americana* + *Curcuma longa*
Mange	Andhra Pradesh	*Azadirachta indica* + *Curcuma longa* + *Annonna squamosa*
Contagious ecthyma	Andhra Pradesh	*Azadirachta indica* + *Curcuma longa*
Eye disease	Maharashtra	*Moringa oleifera*

with a sample size of 100 ICDP units. This study revealed that the education, in-service training, number of villages under jurisdiction, and total cow and buffalo population were exerting direct as well as indirect effects on the overall performance of VLDAs in the positive direction. In-service training has maximum direct effect on the overall performance of VLDAs. Since the variable is easily manipulable, it is suggested that the VLDAs working under ICDP should be imparted in-service training in different areas of their work to improve their overall performance. And these VLDAs can be trained in area-specific ethnoveterinary medicines.

Gupta *et al.* (2006) evaluated immunomodulatory activity of the Ayurvedic formulation "*ashwagandha churna*", a reputed Ayurvedic herbal formulation based on *Withania somnifera*. The experimental paradigms used were cellular (footpad swelling) immune responses to the antigenic challenge by sheep red blood cells (SRBCs) and the neutrophil adhesion test. On oral administration, "*ashwagandha churna*" showed a significant increase in neutrophil adhesion and delayed-type hypersensitivity response. It is concluded that "*ashwagandha churna*" significantly potentiated the cellular immunity by facilitating the footpad thickness response to SRBCs in sensitized rats.

Singh *et al.* (2004) studied efficacy of some ethnomedicinal plant extracts *(Allium sativum, Areca catechu, Azadirachta indica, Butea monosperma, Embelia ribes, Mallotus philippensis, Momordica charantia, Psoralea corylifolia, Pygeum persica, Scindapsus officinalis,* and *Vernonia anthelmintica)* compared with fenbendazole against *Haemonchus contortus* (collected from slaughtered sheep and goats) in an in-vitro trial. Among all the methanolic extracts of the tested medicinal plants, the methanolic extract of *Mallotus philippensis* possessed the highest anthelmintic property followed by that of *Momordica charantia*. Among the ether extracts of different plants, the best efficacy was seen in *Momordica charantia* followed by *Azadirachta indica* leaves. When all the chloroform extracts of the plants were compared, the highest anthelmintic effect was observed in *Mallotus philippensis*, followed by *Momordica charantia*, *Pygeum persica,* and *Azadirachta indica* leaves. Among various aqueous extracts, anthelmintic properties against *H. contortus* were observed in *Mallotus philippensis* and *Momordica charantia*.

Pandey and Kumar (2003) surveyed villages in the districts of Jharkhand to study the diseases of goats and the traditional treatment of these diseases. The most common diseases/disorders of goats are helminthiasis, diarrhea, internal parasites, mange, keratitis/corneal opacity, foot-and-mouth disease, fever/cold, and physical injuries. The diseases are mostly treated with a variety of medicinal plants, where the oils, seeds, roots, bark, leaves and other parts are utilized.

Rohilla and Mathur (2003) presented ethnoveterinary practices followed by farmers in Pali, Rajasthan to treat their livestock for various ailments. Treatment for bloat, diarrhea, retained placenta, mastitis, tick/mite infestation, internal worms, wound/bleeding, foot-and-mouth disease, infertility, uterine prolapse, jaundice, and rheumatism is discussed.

Amitendu *et al.* (2004) studied ITK of animal husbandry, which is in vogue throughout rural India. It is of paramount importance to document these practices and to assess their validity. A semi-structured interview schedule was used for data collection from 18 traditional healers and 70 traditional farmers. An inventory of 63 ITK practices was prepared for dysentery, arthritis, dog bite, cough and cold, anestrus, wound, bloat, and diarrhea. Seven ITK practices were subjected to validation test through the Quantification Indigenous Technical Knowledge method. In all cases the test animals were cattle. All the ITK practices were found to be effective against the respective ailments. However, these were perceived to be comparatively less effective than the Modern Veterinary Drug (MVD) in numbers of animals cured and quickness of healing. The indigenous practices were perceived better than MVD in respect of their availability, lesser side effects, and lower cost. These indigenous practices may be recommended and disseminated among the farmers where MVD is not easily accessible. Moreover, these can be blended with MVD through laboratory experimentation and scientific rationality.

Singla and Manjit Kaur (2002) conducted a survey in the Ropar district of Punjab to determine the most common problems related to dairy animal health that the dairy farmers encounter. Also, the respondents were asked to identify the traditional practices they employ to cure these diseases. A panel of 15 experts from the veterinary college of Punjab Agricultural University evaluated these practices as being 'scientific', 'unscientific', or 'uncertain'. The most common problems included bacterial and viral diseases, digestive and reproductive disorders, and parturition complications. The farmers used herbal medications to treat viral diseases. Experts classified the traditional practice of boiling soybean, fenugreek (*Trigonella foenum-graecum*), *ajwain* (*Trachyspermum ammi*), and dried ginger to treat pneumonia as scientific (100%). However, the experts deemed the practice of giving *kikar* (*Acacia nilotica*) bark juice, feeding chapati and mustard oil to treat foot-and-mouth disease as unscientific. Two traditional practices of curing mastitis and other bacterial diseases, viz., feeding animal with milk and giving chutney of *halo butti* (*kasta-aushadhi*), were deemed as unscientific by the experts. Moreover, practices to treat helminthiasis and lice and tick infestation were also deemed unscientific by all experts. For the treatment of constipation, the farmers fed the animals fenugreek; this was found to be scientific by the experts. Giving *jamun* (*Syzygium cumini*) leaves and *jamun* fruit juice to diarrheic animals was also deemed scientific by 100% of the experts, as with the treatment of indigestion (boiled mixture of black salt, *ajwain*, and jaggery). All practices to counter reproductive disorders were classified by experts as unscientific. The practice of feeding mustard oil to newborn calves and feeding one-month-old calves with dried ginger powder mixed with dough were found to be scientific by all the experts.

Herbal medicines from ancient times comprise some ineffective and highly effective remedies. Herbal drugs have been found useful in treating diarrhea, dysentery, tympany, bloat, spasmodic colic, liver disorder, cough, epistaxis, hematuria, muscular pain, wounds, dermatitis, ectoparasites, retention of placenta/pyometra/metritis/prolapse, mastitis, hypogalactia, infertility/repeat breeding, fever, foot-and-mouth disease, protozoal infections, helminthiasis, and stress.

Advantages of validation of ethnoveterinary medicine are:

- Negative validation will save the farmers from practicing ineffective remedies.
- Positive validation will authenticate the effect of herbal remedies.
- Technology can have widespread effect.
- Development of low cost, local drugs.

World Bank funded NATP (National Agriculture Technology Project) documented 595 ITK practices and most of these were found effective and contain one or more plant ingredients. Another NATP project catalogued 158 plants and evaluated 50 for antiparasitic activity. These may be used as reference text to develop literature for further use. The Indian Veterinary Research Institute (IVRI), Izatnagar, Uttar Pradesh

produced and released the first herbal drug for commercialization in India – available as brand name Ollinall for skin disorders.

Conclusion

Knowledge of old Indian tradition of healing will help to develop appropriate and acceptable technologies that are more suited to our farming system and animal health and may go a long way to achieve sustainable farming and cost-effective veterinary technologies. Farmers may get cost-effective, eco-friendly, safe, easily accessible indigenous veterinary drugs/ treatment. Effective use and validation of traditional Ayurvedic drugs will also be beneficial to boost the share of India in global herbal trade.

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