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# ETHNO VETERINARY PRACTICES FOR COMBATING ANTIMICROBIAL RESISTANCE

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**Abstract:** Prevalence of drug resistance has been reported in many pathogens over the years in different regions of the world including developing countries. Resistance can be described as intrinsic and acquired resistance. Issues related to antimicrobial resistance may be avoided by facilitating herbal research in academia with hypotheses rested with traditional healers of animals. Ethno veterinary medicines can be advocated successfully for the primary health care of livestock and poultry against several microbial diseases. This practice also minimizes the possibility of residues in milk, meat and egg.
**Keywords:** Resistance, Ethno Veterinary Practices, Residues.

## Introduction

Microorganisms have existed on the earth for more than 3.8 billion years and exhibit the greatest genetic and metabolic diversity. They are an essential component of the biosphere and serve an important role in the maintenance and sustainability of ecosystems. It is believed that they compose about 50% of the living biomass. In order to survive, they have evolved mechanisms that enable them to respond to selective pressure exerted by various environments and competitive challenges. The disease-causing microorganisms have particularly been vulnerable to man's selfishness for survival who has sought to deprive them of their habitat using antimicrobial agents. These microorganisms have responded by developing resistance mechanisms to fight off this offensive.

## Antimicrobial resistance

Currently antimicrobial resistance among bacteria, viruses, parasites, and other disease-causing organisms is a serious threat to infectious disease management globally. The observation of Staphylococci spp. that could still grow in the presence of penicillin was the beginning of the era of antimicrobial resistance. Increasing prevalence of resistance has been reported in many pathogens over the years in different regions of the world including

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developing countries (Byarugaba, 2005). This has been attributed to changing microbial characteristics, selective pressures of antimicrobial use, and societal and technological changes that enhance the development and transmission of drug-resistant organisms. Although antimicrobial resistance is a natural biological phenomenon, it often enhanced as a consequence of infectious agents' adaptation to exposure to antimicrobials used in humans or agriculture and the widespread use of disinfectants at the farm and the household levels. It is now accepted that antimicrobial use is the single most important factor responsible for increased antimicrobial resistance.

This factor must be addressed in order to control the spread of antimicrobial-resistant organisms within health care settings. Community acquired antimicrobial resistance is increasing in large part because of the widespread suboptimal use of antibiotics in the outpatient settings and the use of antibiotics in animal husbandry and agriculture. Antimicrobial agents act selectively on vital microbial functions with minimal effects or without affecting host functions. Different antimicrobial agents act in different ways. The understanding of these mechanisms as well as the chemical nature of the antimicrobial agents is crucial in the understanding of the ways how resistance against them develops.

Broadly, antimicrobial agents may be described as either bacteriostatic or bactericidal. Bacteriostatic antimicrobial agents only inhibit the growth or multiplication of the bacteria giving the immune system of the host time to clear them from the system. Complete elimination of the bacteria in this case therefore is dependent on the competence of the immune system. Bactericidal agents kill the bacteria and therefore with or without a competent immune system of the host, the bacteria will be dead. However, the mechanism of action of antimicrobial agents can be categorized further based on the structure of the bacteria or the function that is affected by the agents. These include, inhibition of the cell wall synthesis, inhibition of ribosome function, inhibition of nucleic acid synthesis, inhibition of folate metabolism and inhibition of cell membrane function.

**Mechanism of antimicrobial resistance**

Resistance can be described in two ways: a) Intrinsic or natural whereby microorganisms naturally do not posses target sites for the drugs and therefore the drug does not affect them or they naturally have low permeability to those agents because of the differences in the chemical nature of the drug and the microbial membrane structures especially for those that require entry into the microbial cell in order to effect their action. b) Acquired resistance whereby a naturally susceptible microorganism acquires ways of not being affected by drug.

**Ethno veterinary practices**

Relationship between plants and animals has been continuing from time immemorial. They together flourish with the help and assistance of one another. This relationship was analysed finely after the evolution of human civilisation to a greater extent. The Rigveda describes a lot regarding the close association of human beings with the plants for treatment of their kith and kin (Ayurveda) and their animals using Mrigayurveda or today's Ethno Veterinary Medicine (EVM), the knowledge of which constitutes a relevant part of ethnobiological knowledge. Ethno Veterinary Medicine pertaining to animal health care is as old as the domestication of livestock. Globally, the resource poor rural farmers rely on ancestral folk herbal knowledge (ethno veterinary practices) to deal with the diseases of their livestock and poultry. Veterinarians also show considerable interest in the medicinal plants, employed in traditional systems. There is an urgent need to promote use of Ethno Veterinary Medicine on a wider scale since farmers having either one or two cattle, goats, sheep or chicken need affordable access to primary veterinary health care using cost effective EVM at the earliest as these scattered livestock holdings provide subsistent income for landless labourers, especially farmwomen even in drought conditions (Punniamurthy, 2011). This emerging trend in favour of herbal medicine is also due to the issues related to the antimicrobial drug resistance and drug residues in foods (milk/meat/eggs) of animal origin.

**Ethno veterinary medicines for the primary health care of livestock**

Ethno veterinary medicines can be advocated successfully for the primary health care of livestock and poultry against several microbial diseases. For example, mastitis is a devastating and multi etiological disease involving microbes such as *E. Coli, Staphylococci, Streptococci* etc. Mastitis is economically important disease of livestock and needs immediate intervention. The EVM centre of Tamil Nadu Veterinary and Animal Sciences University at Thanjavur has been successfully advocating a herbal recipe based on traditional knowledge of our country for so many years. The ingredients are Aloe vera –500 grams, Turmeric powder –100 grams and Slacked lime –10 grams. The disc diffusion test could assist in the validation of this recipe. Medicinal plants, identified to be useful for the hepatoprotective activity have been validated at this centre by mRNA expression of cytokines such as IL-6 and TNF-alpha, the pro inflammatory cytokines in the hepatotoxic model. Paste prepared from the leaves of *Nicotiana tabacum* (tobacco), decoction of the fruit *Terminalia chebula* or *Harida* or tar-like oil extracted from the pericarp of the fruit *Semecarpus anacardium* can be applied on the hoofs of the cattle suffering from foot and mouth disease (Chakraborty and Pal, 2012).

Use of neem stick or juice of the plant *Pergularia daemia* against glossitis, either bark decoction of *Adhatoda vasika* and *Ocimum sanctum* leaves or flower decoction of *Calotropis procera* (*Arakha*) and *Vitex negundo* for cough, cold or fever, *Cucumis melo* for bloat and indigestion, *Pyrus pashia, Psidium guajava*, seeds of the plant *Trachyspermum ammi* or Juani and freshginger (*Zingiber officinale*), powdered leaves of *Terminalia arjuna* (Arjuna), *Syzygium cumini* (Jamu) and *Acacia catechu* for digestive disorder, diarrhea and pterygium disease, *Annona squamosa* (Atta) against local infection or *Ziziphus mauritiana* against skin disease are quiet noteworthy. Leaf of *Vervascum thapsus* can be used in bronchitis (Pala et al., 2010). Seeds of *Cucurbita maxima* has been tested positively for their immunomodulatory effects in rabbits (Ranganathan and Selvasubramanian, 2013; Ranganathan and Selvasubramanian, 2015).

Ethno veterinary practices for the treatment of fowl pox in turkey have also been established (Basheer Ahamad, 2013). *Caralluma umbellate* powder has been tested positively for the treatment of hepatotoxicity (Punniamurthy, 2014). The antioxidant marker, phenol has been tested for their presence in *Withania somnifera, Asparagus racemosus* and *Glycirrhiza glabra* available in local market of Thanjavur District, Tamil Nadu (Ranganathan and Punniamurthy, 2013)

**Future perspective**

Issues related to antimicrobial resistance may be minimized by mainstreaming ethno veterinary practices in veterinary curriculum and research as this effort might facilitate herbal research in academia with hypotheses rested with traditional healers on primary health care of livestock and poultry. This would prevent further loss of ethno veterinary knowledge through increased research within the logic of local strategies and augment livestock production and health. This practice may also minimize the possibility of residues in milk, meat and egg.

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