POLICY BRIEF

UNIVERSITY OF VETERINARY AND ANIMAL SCIENCES LAHORE

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Application of acaricidal spray on a livestock farm for tick control

TICK-BORNE DISEASES: A THREAT TO LIVESTOCK ECONOMY AND PUBLIC HEALTH IN PAKISTAN

CURRENT STATUS AND CONTROL STRATEGIES

Policy Message

- More than 19 tick-borne diseases (TBDs) in animals and as many as 16 TBDs in humans are causing huge economic losses to livestock and pose threat to human health.
- Global annual economic losses due to TBDs are estimated to be US$ 16.3 billion.
- Ticks and TBDs in livestock are negatively affecting the leather quality and hence Pakistani leather exports.
- Some population groups like butchers and livestock herders are particularly exposed to human TBDs.
- TBDs can be easily prevented by controlling tick infestation responsible for transmission of the causative pathogens.
- Lack of awareness among the vulnerable communities to adopt precautionary measures and lack of institutional collaboration is leading to huge losses in Pakistan.

Ticks prevail in tropics and subtropics and the dampness in traditional livestock sheds provide a suitable environment. While sucking blood, ticks continue to transmit tick-borne diseases (TBDs) to livestock and humans. Many countries have successfully controlled tick population through multiple approaches, such as the use of acaricides, vaccination, pasture management and necessary restriction on animal movement. In Pakistan, TBDs diseases are on the rise and little attention has so far been given for control. The current brief aims to develop understanding and awareness among relevant stakeholders to control ticks and TBDs and specialists to devise effective control strategies at the national level.

Prevalence of tick-borne diseases in livestock in Pakistan

The most common TBDs in livestock in Pakistan are theileriosis, babesiosis and anaplasmosis. However, in a recent study *Ehrlichia* species (the causative agent of ehrlichiosis) have also been reported in ticks collected on ruminants. So far, a number of studies have reported the prevalence of theileriosis, babesiosis and anaplasmosis in ruminants from almost every corner of the country. The prevalence of TBDs is high in exotic and crossbred animals as compared to native breeds. Native breeds have been reported to be relatively resistant to ticks, responsible for the transmission of these diseases. Among TBDs, theileriosis is of high economic significance because of the high mortality rate, i.e. up to 80%, in exotic cattle. Anaplasmosis is more

Featured case studies

1—The elimination of ticks and tick-borne diseases has successfully been done in cattle population of many states of the USA. The goal was achieved by the strict restriction in movements and transportation of animals from one part of the state to others, isolation of diseased animals from healthy ones, managed and proper surveillance of diseases, dipping of the animals which was monitored by state authorities, acaricidal treatment of animals, pasture management with rotations of crops as well as animal herds between pastures.

2—South Africa has eliminated theileriosis by killing or isolation of affected animals, dipping of animals, control of ticks by pasture rotation in order to breakdown their life cycle and by fencing of the farms. The disease was also eliminated in Zimbabwe and Switzerland by following the same control strategies.

3—China has controlled theileriosis using 'Bovine Theileria annulata Vaccine' with great success in the 1970s. Afterwards, in addition to the application of these two specific measures, strategies to eliminate the ticks were also applied which basically made a major breakthrough in the effective control of theileriosis in China in the 1980s.

A cattle calf infested with ticks (neck region)

Electron micrograph of Rhipicephalus microplus tick (mouth part) responsible for the transmission of *Babesia* spp. in animals

common in buffaloes as compared to cattle.

Factors affecting tick-borne diseases in livestock

Several risk factors contributing to the occurrence of ticks and transmission of TBDs have been identified globally. The climate and habitat type affects tick distribution patterns and TBDs. The effect of host characteristics has conferred various degrees of resistance to tick infestation. Studies on risk factors for acaricide resistance in ticks have shown that a higher rate of acaricide application is associated with the selection of resistant tick species. However, the timing of treatments within the yearly cycle(s) of tick development is likely to be more important than frequency alone. Husbandry practices, locations, and age of the host have been found as important risk factors associated with *Theileria annulata* infection. The abundance and distribution of ticks due to poor husbandry practices and the presence of a susceptible host such as exotic cattle are the most important determinants associated with TBDs.

Tick-borne diseases of Public health significance

Tick-borne diseases of Public health importance can vary from life-threatening infections, such as Crimean Congo Haemorrhagic Fever (CCHF), tularemia and Rocky Mountain Spotted Fever (RMSF), to potentially chronic infections, like Lyme disease. Recently, new zoonotic viral diseases have also emerged in Southeast Asia, such as Nipah virus infection. CCHF is endemic in Pakistan and about 100 deaths are reported every year from different parts of the country. Despite awareness campaigns and tick control measures by the Government to control CCHF in Pakistan, the incidence of the disease is not decreasing. Although most of the bird species are resistant to CCHF, ostriches can harbor and spread the infection to farm workers and during the last couple of years, ostrich farming has gained interest in the country, which should be considered while developing any control strategy against CCHF. Therefore, in recent studies, *Coxiella burnetii* (the causative agent of Q-fever) and rickettsial organisms (responsible for causing RMSF) have been reported in Pakistan.

The economic significance of tick-borne diseases

The economic losses caused by ticks and TBDs vary widely with respect to spatio-temporal factors due to differences in husbandry practices and production systems, breed types, disease control policies and programs. The economic losses associated with TBDs are mainly due to morbidity and mortality caused by these diseases. Ticks transmit more infectious agents than any other blood-sucking arthropod. These diseases subsequently result in reduced milk, low-quality meat and wool production, induced abortion and high mortality in livestock herds. The global economic loss associated with TBDs is

estimated to be US$ 16.3 billion annually. Recent studies in Australia and India have also assessed production losses at US$ 26 million and 499 million per year, respectively. In a recent study in Pakistan, the economic impact of theileriosis on a corporate Holstein Friesian dairy farm was calculated. The total expenditure incurred due to theileriosis was US$ 74.98 per animal and hence theileriosis caused a significant economic loss of US$ 18,743 on this farm. More importantly, increased susceptibility of exotic cattle breeds to tick infestation and TBDs restricted their introduction in most parts of the country and did not allow the expansion in the dairy sector.

Available control strategies against ticks and tick-borne pathogens

Presently, numerous control strategies, which include tick control, drug treatment and vaccination are globally used to minimize the economic losses associated with TBDs. Tick-control is the most widely and frequently used method of controlling TBDs in animals. The reliance on acaricides is however declining due to the growing tick resistance to acaricide. Acaricidal residues in milk and meat are another important area of public health concern.

Use of drugs against tick-borne pathogens

Tick-borne pathogen infections are generally treated with either antibiotics or antiprotozoal drugs depending on the type of pathogen involved. Commonly used antibiotics against tick-transmitted bacterial pathogens, particularly *Anaplasma* spp., include tetracycline and doxycycline. Antiprotozoal drugs are also used for prophylaxis. Use of medicines to control TBDs is a costly choice and it does not always completely clear infections, which may lead to the development of resistance to the drug by the pathogens and leave the animal and human as a carrier of the disease.

Vaccination against tick-borne pathogens

Due to inadequacies in prevention and control of TBDs based on chemotherapy, the requirement of potentially effective vaccines against TBDs is rapidly increasing. Live vaccines against tick-borne pathogens have been made available for the last two decades, but in spite of their clear efficacy, they have not been adopted worldwide. Lack of facilities and resources for vaccine production and supply on large scale, as well as fear of the introduction of new pathogen strains into regional tick populations, have generally restricted the utilization of these vaccines. Recently, studies have aimed at the development of subunit vaccines against *Theileria* species. For *Babesia* spp., live attenuated vaccines against *B. bovis, B. bigemina* or *B. divergens* are produced in many countries using the blood of the infected animals or from *in-vitro* culture, however, there are issues regarding the safety of these vaccines. Although anaplasmosis has a worldwide distribution, there is no conventional vaccine available. Blood-based live vaccines have been used in tropical regions to protect cattle, however, during vaccination against *Babesia* spp., chances of transmission of other pathogens to the vaccinated animals always exist.

Where does Pakistan stand?

Grooming of skin with manual removal of ticks followed by their burning is the most commonly used tick control strategy at traditional rural dairy farms. Other uses medications like spray with Trichlorfon and use of Ivermectin during high-risk months, particularly before and during Eid-ul-Azha, is practiced to reduce chances of human related TBDs. However, due to lack of information on tick-borne pathogens species involved in the occurrence of TBDs, a long term strategic program for prophylaxis is not practised in Pakistan.

Policy implications

1—There is a dire need of surveillance program to map the real-time distribution of CCHF virus through continuous screening of animals as well as tick samples.

2—Integrated and multi-institutional mechanisms are required to report the prevalence of tick-borne diseases status and study on the genomics of tick species to produce local vaccines.

3—Regular coordination among livestock, public health and local government departments needed to control TBDs like CCHF.

4—Nevertheless, confirmatory diagnosis of theileriosis, babesiosis and anaplasmosis through PCR has been established. A better starting point to control TBDs in Pakistan is to start controlling the disease in the proposed foot and mouth disease-free zones through effective vaccination, restriction on animal movement and disease surveillance.

5—Tick-borne diseases need to be monitored like other diseases of livestock on regular basis with more focus during summer, particularly when it coincides with Eid-ul-Azha.

6—The awareness raising campaigns among livestock keepers for ticks' management by the Directorate of Communication and Extension, Livestock and Dairy Development Department, Government of Punjab should be enhanced. These are particularly required during the summer

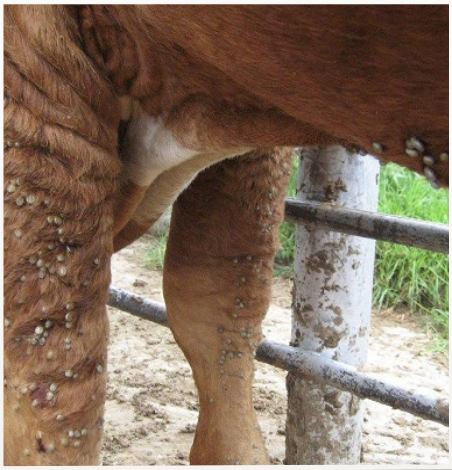
Livestock market: the main place/source for spread of various diseases

months and prior to Eid-ul-Azha to prevent losses to the human population

7—Studies on vectors ecology are required through different universities to point better ways to manage the consequent ailments.

8—Research on ticks for the detection of the commonly harbored pathogen in different agro-ecological zones of Pakistan as well as acaricide resistance to choose the most effective acaricide.

9—Research on genetic resistance to tick infestation in all indigenous livestock species can pave the way for having a tick tolerant/resistant livestock selection for further breeding.



Showing heavy tick infestation on legs and abdominal region of a cattle

A case of tick bite in human beings that may result in fatal consequences

Researchers Featured

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Further Reading

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Explained Terminologies:

Acaricides: Drugs/chemicals which are used to kill ticks and mites

Elimination: The reduction to zero of new cases of specified disease in a defined geographical area

Morbidity: The rate of disease in a population

Mortality: The rate of death in a population

Prevalence: The proportion of a population with a disease at a specific point in time

Prophylaxis: Treatment given or action taken to prevent diseases

Spatio-temporal: Geographical and time related components

Surveillance: The continuous systematic collection, analysis and interpretation of health-related data and its dissemination to the major stakeholders

Tick-borne Diseases (TBDs): Diseases which are transmitted through tick bite

Vector: A small organism (usually an arthropod) that transfers pathogens from one host to another

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