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Tick Control Strategies in Dairy Animals

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Abstract

The control of arthropod ectoparasites of livestock by systemically delivered chemicals was introduced in the 1950s. Because of their low cost, ease of use, and high level of efficacy ensured for ectoparasite control. The control of acarines like tick is essential for animal husbandry. However, current societal and scientific concerns regarding dependency upon chemicals have emphasized the need for the evaluation of environmentally safe alternatives for tick control. Immunological and biological intervention for the control of tick populations, through the vaccination, is effective way of control. Unlike the activity of chemicals, currently available vaccines do not induce a rapid knockdown of the parasite population and they do not protect the individual from parasitism however if these vaccines are used in an integrated Pest management programme, they have the potential to reduce parasite population over successive generations and reduce or eliminate the need for chemical application.

Introduction

Ticks are economically the most important pests of cattle and other domestic species in tropical and subtropical countries. They are the vectors of a number of pathogenic microorganisms including protozoans (babesiosis, theileriosis), rickettsiae (anaplasmosis, ehrlichiosis, typhus), viruses (e.g., Kyasanur Forest Disease), bacteria (e.g., Pasteurella, Brucella, Listeria, Staphylococcus) and spirochaetes (Jongejan and Uilenberg, 2004). The only food for the ticks is blood. They are voracious blood suckers; loss of blood for their rapid development impoverishes the hosts. In heavy infestation cattle must have more feed merely to meet the demands of the parasites; the growth of young animals is retarded, and they may remain thin, weak and stunted. In dairy cows, milk production is greatly reduced. Ticks belonging to genus Ixodes and Ornithodorus lahorensis are associated with tick paralysis which is a specific type of intoxication, resulting from the injection of

a toxin by certain instars of ticks usually the adult females but sometimes by nymphs. Sweating sickness is a disease of cattle and other domestic species which occurs in South, Central and East Africa. It is associated with infestation by Hyalomma truncatum and has all characteristics of toxicosis (Barnett, 1961). Although, economic losses due to ticks are mainly due to the diseases which they transmit (Garcia, 2003), financial losses associated with nagging irritation and depreciation of the value of skins and hides (upto 20- 30%) are also significant (Biswas, 2003). In severely tick infested young cattle, sometimes ticks have been found in the oral cavity as well as in the stomach. They reach here as a result of constant licking induced by irritation. The present treatise attempts to review some of the pragmatic tick control measures in dairy cattle and buffaloes.

Tick Control Methods

An integrated control strategy based on the following measures is recommended for the control of ticks in cattle and buffalo:

2.1 Housing in tick proof buildings

To the extent possible, cattle and buffalo sheds should be ticking proof especially for the housing of purebred exotic and crossbred cattle, as they are more susceptible to the tick infestation than native cattle and buffaloes. There should be no cracks and crevices in the buildings (as the ticks hide and breed there). Caulking of the walls of the animal's sheds is an inexpensive measure that significantly reduces the tick burden. An acaricide channel should encircle the entire building. Heaps of dung cakes and stacks of bricks may also provide breeding places to the ticks in animal sheds and should therefore be removed regularly.

2.2 Slow burning of the wastes near the walls of the animal sheds

Since the female ticks generally lay their eggs in the cracks and crevices in the walls of the animal sheds, scrapping of the farm waste (feces and feed waste, etc.) against the walls of unoccupied paddocks and its slow burning over a period of one or two days is quite effective in reducing the tick burden on the animals. This practice should be periodically repeated. All common-sense precautions should be exercised while resorting to this practice.

2.3 Separate housing of cattle and buffaloes

Cattle (in particular those with exotic blood) are more susceptible to tick infestation than buffaloes. Buffaloes do not usually carry cattle ticks except under exceptionally stressful conditions. They are not normal host of cattle ticks (Lemcke, 1997). When cattle and buffaloes are mingled

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together, the buffaloes sometimes also suffer from heavy tick infestation. Therefore, cattle and buffaloes should be housed separately.

2.4 Quarantine

Newly purchased animals should not be mixed right away with the already existing stock on the farm. If ticks are present on the bodies of new arrivals, they should be treated with acaricides so that they are free from ticks before adding them to the existing herd.

2.5 Pasture spelling and rotational grazing

Pasture spelling and rotational grazing have been shown to be capable of greatly reducing the population of one-host ixodid tick Boophilus microplus on dairy farms in Australia (David, 2005). If cattle are placed on spelled (i.e., divided) pastures early in winter when the ticks are producing few or no progeny and then alternated at 4-monthly intervals, the tick population can be controlled with a markedly lower number of acaricidal treatments. The spelled area to be grazed should first be checked by introduction of susceptible tracer calves. Pasture spelling and rotational grazing have been shown to be capable of greatly reducing the population of one-host ixodid tick Boophilus microplus on dairy farms in Australia (David, 2005). Pasture spelling and rotation of pastures are not very effective for the control of multihost ixodid ticks (e.g., Hyalomma anatolicum anatolicum) or argasid ticks because of the long survival periods of the unfed nymphs and adults (David, 2005).

2.6 Manual removal of ticks

Where the number of tick infested cattle and buffaloes are very small, farmers remove the ticks manually generally at the time of milking. Ticks so removed are killed by putting them on a smoldering dung cake placed nearby. For manual removal of ticks, using the forefingers, first grasp the tick close to the animal's body and then twist it counter-clock wise. Entire tick can be removed in this way and with only little discomfort to the animal (Muhammad, 1994). Cattle enjoy manual removal of ticks. A caveat is pertinent with manual removal of ticks. When removing the tick manually, consideration should be given to the possible hazard to humans from pathogens present in these ticks. The most important and deadly human pathogen that has been recognized is Crimean-Congo Hemorrhagic Fever (CCHF) virus, usually associated with ticks of the genus Hyalomma (Jamil *et al.,* 2005). CCHF is widely prevalent within the geographical distribution of Rhipicephalus appendiculatus. Investigators collecting ticks for experiments as well as the average farmers should, therefore, be made aware of the possibility of transmission of CCHF virus potentially associated with

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manual removal of ticks. Ticks should preferably be removed with the forceps and in no case crushed between the fingers (OIE, 2004).

2.7 Clearance of vegetation

Various stages of some ticks (e.g., Boophilus species) attach themselves to the blades of grass and other vegetation and stealthily attach to the cattle passing nearby. Though clearance of vegetation will annihilate their places of shelter, this type of action, however, may encourage soil erosion and may be detrimental to the ecosystem.

2.8 Use of Acaricides

Modern acaricides belong to the general classes of organophosphates (chlorfenvinphos), formamidines (amitraz), synthetic pyrethroids (flumenthrin), phenylpyrazoles (fipronil) and benzylphenylureas (fluazuron) correctly applied and they can be highly effective. At present, periodic application of acaricides (agents used to kill ticks and mites) is the most widely used method of tick control in dairy farming. Control of ticks with acaricides may be directed against the free-living stages of ticks in the environment or against the parasitic stages on host. Acaricides can be applied by dipping, washes, spraying, pour-on, spot-on or by injections. Insecticide ear tags are commercially available in some countries for the control of horn flies, face flies and spinose ear ticks. Dipping is an expensive operation but is desirable when a large number of cattle are to be treated or when a tick eradication programme is in place. The frequency of dipping depends upon the species of the tick infesting the cattle. In the case of Boophilus microplus, dipping every 21 day is recommended to break the life cycle because 18 days is the least time from the dropping off of an engorged female to time when larvae can be ready for infestation, and the dip gives protection for three days (Hungerford, 1990).

2.9 Tick vaccines (Immunological control)

New approaches are needed for effective control of ticks and tick-borne diseases (TTBDs), of which vaccines appear to be an effective and environmentally sound option. The only commercially available vaccines against ectoparasites were developed and registered in the early 1990s for the control of cattle tick infestations (Fuente *et al.,* 2000). These vaccines are based on Recombinant Rhipicephalus microplus BM86/BM95 antigens and demonstrated the important advantages of being a cost-effective and environmentally friendly alternative with a dual effect of reducing tick infestations and preventing ticks from transmitting disease-causing pathogens. The

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protective mechanism characterized for BM86/BM95 tick vaccines is based on the development of antigen-specific antibodies in immunized hosts that interact and subsequently affect the biological function of the targeted antigen within the tick tissues, impairing tick feeding on the immunized hosts (Merino *et al.*, 2011). The application of the BM86/BM95- based vaccines results in reduction of the number, weight and reproductive capacity of engorging female ticks, resulting in a gradual reduction in tick infestations in subsequent generations.

2.10 Ethnoveterinary practices against ticks

Several plants and herbs have been shown to possess anti-tick insecticidal, growth inhibiting, antimolting and repellent activities. A number of reports are available on the effect of different extracts of plant material on tick species. Preliminary results obtained by Indian workers (Ghosh *et al.*, 2007) with alcoholic extracts of sitaphal (Annona squamosa) and neem (Azadirachta indica) against different life stages of Hyalomma and Boophilus are highly encouraging.

3. Conclusion

In conclusion, ticks' infestation is a significant cause of economic losses to the dairy industry all over the world. At present, the use of acaricide is the most commonly used method of tick control. To the extent possible, dairy farmers and veterinarians should make use of an integrated tick control strategy based on utilization of biological control method, breeding for tick resistance etc. The use of vaccines for tick control is on horizon.

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