This paper reviews the studies on the prevalence, vector role, chemotherapy and biological control of ticks in poultry. Ticks of the genus Argas are the most prevalent. Ticks were reported to transmit bacterial, viral and parasitic diseases to poultry. The most important and frequently transmitted disease was found to be the spirochaetosis. A variety of chemicals are used for the control of tick infestation in poultry. These include carbamates, pyrethroids, herbal products, organophosphates and ivermectins. The most promising results, however, were reported with pyrethroids and organophosphates. Biological control of tick infestation in poultry. These include carbamates, pyrethroids, herbal products, organophosphates and ivermectins. The most promising results, however, were reported with pyrethroids and organophosphates. Biological control although have not widely accepted for application, yet some bacterial and fungal species have been found to be effective. Based on the review, conclusions have been drawn for further research into the tick infestation of poultry.

Key Words: Ticks; Poultry

INTRODUCTION

The ectoparasites of poultry like ticks, lice and mites play an important role in the transmission of certain pathogens which cause heavy economic losses to poultry industry. They cause heavy morbidity by sucking blood and causing irritation to the birds which adversely affects the economical production of poultry (Phulan et al., 1984). Ectoparasites cause weight loss at the rate of about 711 g per bird and decrease the egg yield at the rate of about 66 eggs per bird in a year (Elkifl et al., 1973). Among ectoparasites, fowl ticks may cause ruffled feathers, anaemia, emaciation and lowered production. Heavy tick infestation may cause loss of blood leading to anaemia and eventually death (Bergstrom et al., 1999). In addition, they are also known to transmit certain parasitic, bacterial and viral diseases like leucocytozoonosis, Aegyptianellosis, Pasteurellosis, Avian encephalomyelitis, Borreliosis and fowl cholera (Permin & Hansen, 1998). Larval forms of these ticks also cause paralysis (Rosenstein, 1976). The purpose of this paper is to review the studies on tick infestation in poultry and associated risks.

Prevalence. There are a number of species of ticks infesting poultry. These include Argas persicus (Fahmy, 1952; Reid, 1956; Frolov et al., 1972; Petrov, 1972; Akhundova & Terskikh, 1972; Galun et al., 1972; Elkifl et al., 1973; Stefanov et al., 1975; Leeflang & Ilemobade, 1977; Glukhov & Noviko, 1978; Gryaznova et al., 1978; Kachekova & Frolov, 1978; Orichova et al., 1978; Burriro & Akbar, 1978; Frolov et al., 1978; Sluda et al., 1979; Soni, 1979; Burriro, 1979; Sokolov et al., 1980; Li & Yamykh, 1981; Hafeez & Irfan, 1982; Gyurov, 1983; Burriro, 1983; Ayeni et al., 1983; Phulan et al., 1984; Frolov et al., 1985; Khan et al., 1986; Abdu, 1987; Soliman et al., 1988; Dikaev, 1988; Oyoun et al., 1988; Pavlovic et al., 1988; Tien & Guan, 1989; Oyoun et al., 1990; Pavlovic & Nesic, 1991; Sheik, 1991; Kumar et al., 1992; Mir et al., 1993; Chhabra & Donora, 1994; Saida-I et al., 1995; Kulisic et al., 1995; Hassanain et al., 1997; Axtell, 1999; El-Kady et al., 1999; El-Kammarah et al., 2001; Habeeb et al., 2001; Keirans & Durden, 2001; Khan, 2001; Permin et al., 2002), Argas robertsi (Hoogstraal et al., 1968), Argas (P. persicus) zumpti (Hoogstraal et al., 1968), Argas giganteus (Kohls & Clifford, 1968), Argas himalayensis (Hoogstraal & Kaiser, 1973), Argas (P. persicus) nullaborensis (Hoogstraal & Kaiser, 1973), Argas polonicus (Sluda et al., 1979), Argas africae (Kraiss & Gothe, 1982), Argas walkerae (Norval, 1985), Argas reflexus (Dikaev, 1988 & Kulisic et al., 1995), Argas vulgaris (Dikaev, 1988), Argas hermaniai (Oyoun et al., 1990), Argas monolakensis (Schwan et al., 1992), Argas miniatatus (Evans et al., 2000), Argas arbores (Belozerov et al., 2003), Ixodes ricinus (Bernard & Bieseman, 1986), Amblyomma variegatum (Okaeme, 1988), Ixodes columnae, I. persulcatus, I. tarsus, Haemaphysalis flavus and H. longicornis (Ishiguro et al., 1997), Ixodes auritulus (Evans et al., 2000), Amblyomma americanum (Durden et al., 1997; Kinsey et al., 2000; McK et al., 2001), Amblyomma maculatum, Haemaphysalis leporispalustris, Ixodes brunneus, I. minor and I. scapularis (Durden et al., 1997 and Kinsey et al., 2000), Amblyomma tigrinum (Labrun et al., 2002), Amblyomma triste (Labruna et al., 2003), Haemaphysalis punctata, Hyalomma lusitanicum and Ixodes frontalis (Calvete et al., 2003) and Amblyomma aureolatum and Ixodes auritulus (Arzua et al., 2003).

The prevalence of tick infestation varies in different months/seasons of the year. It is found highly prevalent in December, May (Elkifl et al., 1973), April to November (Sluda et al., 1979), August (Phulan et al., 1984), September to November (Anjum, 1990), summer and spring (Oyoun et
Tick infestation varies with different breeds of poultry. It is more in Harco and least in Babcock (Ugochukwu & Omije, 1986).

**Vector role of ticks.** Transmits bacterial, rickettsial, viral, and parasitic and spirochaetal diseases in poultry. *A. persicus* transmits Salmonella pullorum (Steffanov et al., 1975), Mycoplasma gallisepticum (Glukhov & Novikov, 1978 and Soliman et al., 2001), Mycoplasma meleagridis (Soliman et al., 1988, Salmonella gallinarum (Gyurov, 1983), Aegyptianella pullorum (Leelfang & Ilemobade, 1977 and Tsenov, 1983), West Nile virus (Abassy et al., 1993) and Borrelia anserina (Leelfang & Ilemobade, 1977; Roday & Soni, 1977; Buriro, 1979; Hafeez & Irfan, 1982; Khan et al., 1986; Abdu, 1987; Nemova et al., 1990; Rashid & Ali, 1991; Sa-idu-L et al., 1995; Ishiguro et al., 1997; Bhatti et al., 2001; Durden et al., 2001). *Argas persicus* harbours different types of bacteria including those of genus Salmonella, Aerobacter, Escherichia, Proteus, Staphylococcus, Flavobacterium, Bacillus, Pseudomonas and Streptococcus (Buriro, 1983).

*Argas persicus* infestation causes paralysis in birds (Rosenstein, 1976; Grysmanova et al., 1978; Soni, 1979). *Argas persicus* larvae have been responsible for simultaneous occurrence of Infectious Bursal Disease and Spirochaetosis (Abdu, 1987). The ticks, Amblyomma americanum, A. maculatum, Haemaphysalis leporispalustris, Ixodes brunensis, I. Minor and I. scapularis transmit Borrelia burgdorferi (Durden et al., 1997; Slowik & Lane, 2001). Migratory birds are able to carry Lyme disease Borreliosis (Borrelia burgdorferi) as a latent infection for several months and this infection can be reactivated and passed on to Ixodid ticks as a result of migratory restlessness thus causing further transmission through ticks (Gylfe et al., 2000; Kaiser et al., 2002).

**Chemotherapy.** A variety of chemicals are used for the control of tick infestation in poultry either by application to the birds or poultry houses. These include topical application of N, N- diethyl-2-phenylacetamide (DEPA), N, N- diethyl –3- methyl benzamide (DEET) and Dimethyl phthalate (DMP). DEET and DEPA are more effective (Kumar et al., 1992), feeding of chicks with 100 fg Ivermectin per kg body weight (Mousa et al., 1988), dipping of tick infested chicken legs in 0.05% deltamethrin (Tian & Guan, 1989), bromocyclen spray to the birds and treatment of their houses with 0.6% bromocyclen (Pavlovic et al., 1988), topical application of 1:20 dilution of pestoban (a liquid concentrate of various non –poisonous plants) (Sinha et al., 1987), application of 0.5% trichlorfon, 0.25% crotoxyphos or 0.25% carbaryl @ 25-50 mL per bird and spraying the poultry houses with 1-2% trichlorfon, 0.25% diazinon, 0.02% dichlorvos, 0.5% crotoxyphos, 0.1% carbaryl or 0.25% dicresyl (Frolov et al., 1985), phosalone, tetrachlorvinphos, porpoxur and fenethacarb (Frolov et al., 1978), application of 1-1.5% flalofo (phosmet ) to poultry houses at the rate of 150–200 mL/sq.m (Frolov et al., 1972), ectocide, a preparation containing 10 g of pyrethrins, 15 g piperonyl butoxide, 3 g benzalkonium chloride and water to make 100 g (Li & Yarnykh, 1981), Aerosol of 2% “4 – 74” (carbamate preparation) (Sokolov et al., 1980) and pyrethroids (bioallethrin, biopresmetrin, neo – pinamin and pybuthrin) (Kacheveva & Frolov, 1978).

**Biological control.** Biological control of tick infestation in poultry includes, the cessation of egg laying by females of *A. persicus* after exposure to irradiation (Galun et al., 1972), Entobakterin and Dengrobacillin (preparations of spores and endotoxin of *Bacillus thuringiensis*) and Boverin (conidiospores of the fungus Beauvaria bassiana), active alone or in combination with chemical pesticides in the control of arthropods (Frolov, 1974) and activity of *Bacillus thuringiensis* against *A. persicus* (Hassanain et al., 1997).

**CONCLUSION**

This review suggests different epidemiology of tick infestation in various areas. Therefore, investigations on epidemiological aspects of tick infestation in poultry in Pakistan should be carried out to devise an effective control.

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