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A review on fasciolosis

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Abstract
Parasitism is one of the main causes limiting livestock productions in most of the tropical and sub-tropical countries of the world. Parasitism has been considered as one of the major constraints of livestock production. The incidence of parasitic diseases in the domestic ruminants is also high and as a result hardly any livestock industry could develop could here. There are about 38.1 million small ruminants (goat and sheep) which play an important role in the rural economy and earn substantial amount of foreign currency by exporting skins and other by-products. Besides a large number of helminth parasites these are constantly deteriorating the health and productivity of the ruminants.

Keywords: fasciolosis, livestock, parasitism, helminth and trematodes

Introduction

Fasciolosis also known as Fascioliasis, Distomatosis and liver Rot is an important disease of cattle caused by trematodes *i.e. Fasciola hepatica* and *Fasciola gigantic* (common liver flukes). This condition of internal parasitism is one of the major problems that lower the livestock productivity throughout the world said to Vercruysse and Claserebont (2001). Rondelaud *et al*. (2001) [31] have been reported the significance of helminth infestation has been increased many folds in developing countries has been increased many folds in developing infestation has been increased many folds in developing countries, the disease is of paramount importance due to its broad distribution and definite hosts. It causes acute and chronic infections (Sampaio Silva *et al.*, 1996) [33]. The disease in predominantly caused by *F. hepatica* or *F. gigantica* (Soulsby, 1987) [37].

Prasad (2004) [28] has been reported that Among Livestock population, goats occupy an economically significant position in India. Goats are the main source of meat (about 37% of the total meat), besides milk (about 3% in our country. India possesses the largest goat population and ranks first in the world. Goat rearing is more important in arid and semiarid mountainous regions of Rajasthan, Western M.P., Foothills of Himalayas and Kashmir valley. From the socio economic point of view, it provided a dependable source of income to 40% of the rural population below the poverty line in India and many who do not possesses any land (ICAR 2002).

The common liver fluke, *F. hepatica* is a trematode and widely distributed throughout the world. It occurs chiefly in cattle, sheep, goats, buffalos and may affect man / other species. The mature flukes live in the bile ducts and immature live in the parenchyma of liver, very rarely in other organs. They are flat and mostly resemble a laurel leaf in outline. The adult are 18-30 mm long and 4-13 mm broad appearing dirty grey to brownish in colour. Eggs are excreted through feces and require snail as intermediate host that lives mainly in water. The parasites pass through different stages in snail before attaching themselves in the form of cysts to the ground vegetation. There on it is taken up by the host during grazing. Cyst wall is dissolved in the gastrointestinal tract of the host and the young fluke emerges. It penetrates and passes through intestines into the liver. Spends 6-8 weeks drifting in liver and then settles down in the bile duct. In the host the total period of development *i.e.* from swallowing of the cysts to develop into sexually mature parasite is 2-3 months. Most of the above description is also applicable to *F. gigantica*, another species of liver fluke, which is restricted to certain circumstances it may cause tropical areas. Under certain circumstances it may cause severe damage to the liver. In adult cattle, the infection takes a chronic course, with no obvious clinical signs. Significant production losses occur in the herds having a prevalence of *F. hepatica* infection of 25% or above (Vercruysse and Claerebout, 2001) [46].

Nearly 700 million of the world's poorest people rely on livestock for their survival. Sheep, goat and cattle are the most numerous agricultural species worldwide. The global estimate of 1.33 billion head of cattle and 1.04 billion sheep demonstrates the central importance of the animals to the world economy. These farm animals represent a critical and often sole source of economic security for people in the developing world. Successful livestock management forms a key stepping stone in sustainability and economic growth. In spite of the crucial link between animal health and human health, and between livestock and livelihood, only 45 of international aid are directed to agricultural needs in developing countries (Robert *et al*., 2009) [30].

Related Work

The World Health Organization (WHO, 2006) [47] has estimated that 2.4 million people are infected with *Fasciola hepatica* and further 180 million are at risk of infection. Generally speaking, fascioliasis tops all zoonotic parasites worldwide. Animal fascioliasis is known in Egypt since a

long time (Pal and Qayuum, 1993) stated that fasciolasis was known as sporadic cases. In the last two decades, human infection have been increased and identified from several Egyptian governorates. Dakahlia is one of the highly infected governorates (Ali *et al.*, 2001) [1]. No doubt, infected animals are the main source for human infection.

Fasciolosis, have been reported by many workers (Azad*et al.*, 1997 and Razzaq *et al.*, 2002). *Fasciolosis* is a significant livestock problem; yearly an estimated US$ 2 billion are foregone due to weight loss, reduction in milk yield and fertility in production animals. Fasciolosis is a dangerous disease leading to be a huge economic loss in livestock production and causing severe illness in human livers (Hussein *et al.*, 2009) [15].

Urquhart (2000) [45] mentioned that in acute form of fasciolosis, there was a massive invasion of immature flukes into the liver which cause sudden death; while in chronic form, there was liver cirrhosis cause by the wandering fluke in which mature fluke lodged into the bile ducts, causing its calcification. Spithill *et al*. (1999) [40] have shown economic losses caused by *F. gigantica* to be more than US$ 3200 Million. Torgerson and Claxton (1999) [42] have discussed these economic losses interms of loss of wool production, milk yield and fertility. Howlader and Huq (1997) reported anemia in sheep and goats. The pathogenic effect of this parasite is extended over a large number of domestic ruminants; cattle, sheep, goats and buffaloes are mostly affected and drain a substantial economic loss to the country annually.

Infection with *Fasciola gigantica* is regarded as one of the most common single helminth infection of ruminants in Asia and Africa (Hammond and Sewell 1990). This disease causes enormous economic losses all over the world and these losses are due to reduction in milk and meat production, condemnation of liver, loss of draught power, reproductive failure and mortality (Diaw *et al.*, 1998) [9]. Recently, worldwide losses in animal productivity due to Fascioliasis were conservatively estimated at over US $ 3.2 billion per annum. In addition, Fascioliasis is now recognized as an emerging human disease.

Dawes and Hughes *et al.*, (1964) [8] reported the life span of the liver fluke adult in sheep can be as long as 11 years, whereas in cattle it is only up to 9-12 months. Soulsby (1978) [38] described acute and chronic form of fascioliasis, acute fascioliasis due to heavy infection resulting in rupture of liver capsule and haemorrhages into the peritoneal cavity. The liver was described to be enlarged, pale and friable due to the migratory tracts. In less acute cases, leucocytic infiltration and fibroblastic activities have also been reported.

Chick *et al.* (1980) [4] has been focused on infection with liver flukes also reduces milk production and affects its composition and quality. Kulkarni and Despandwy (1985) [18] recorded the incidence of pathological conditions of liver such as – fatty changes, cirrhosis, necrosis and chronic venous congestion. Singh and Parihar (1988b) in their study found that 47.14% of the livers showing abnormalities were infected with flukes.

Saleha (1991) [32] briefed and focused the economic losses in consist of costs of anthelmintics, drenches, labor, liver condemnation at meat inspection and losses in production due to mortality, reduction in meat, milk and wool production, and reduction in growth rate, fertility and draught power. The disease also has public health significance, causing human fascioliasis. Jarjees *et al.* (1999) [17] recorded the incidence of pathological conditions, such as Hepatitis cysticercosa and fascioliasis, after slaughtering these animals. Tripathi *et al.* (2001) [43] recorded the incidence of the hepatic disorders in goats, as reported by various workers, ranged from 0.1% to 78%. EI-Shazley *et al*. (2002) [10] conducted parasitological examination for fascioliasis in buffalo.

Ramazan *et al*. (2003) [29] carried out a study in 80 pure breed female Damascus goats, aged between 4-7 years using clinical, biochemical and ultra sound examination for fatty liver. 30 goats (37.50%) were diagnosed as having sub clinical fatty liver. The level of cholesterol, AST, ALT, ALP and LDH were measured to be in reference ranges in all animals. Conjugated bilirubin, albumin and total protein decreased in goats with fatty liver than in those without fatty liver.

Gupta *et al.* (2008) [11] have been observed Necropsy examination of buffaloes slaughtered at different zones of Uttar Pradesh (Varanasi, Allahabad and Lucknow) showed fascioliasis in 9.1%, 8.1% and 37.5%, whereas amphistomosis was found in 53.8%, 32.3% and 52.5% of animals, respectively. *F. gigantic* eggs were detected in 1.7%, 23.8% and 35.0% of buffaloes while amphistome eggs were found in 21.8, 31.7 and 50.0% of buffalo faeces collected from Varanasi, Allahabad and Lucknow. Taluder *et al*. (2010) [41] have been reported that age of the animal has significant effect on fascioliasis in goats. Significantly ($P<0.01$) highest infection rate was found in 2-2.5 years old animals (50%). The sex of the animal was also found as important determinants for fascioliasis. In this study out of 219 males goat livers 30 (13.70%) were infected with *Fasciola*. On the other hand, out of 106 female goat livers, 40 (37.70%) were found positive with Fascioliasis.

Liver fluke infections can be highly pathogenic and can lead to severe morbidity and even death of the host. The flukicidetriclabendazole is still the drug of choice used in *Fasciola* control programs (Overend and Bowen, 1995) [26] however; the high cost of treatment prevents widespread use by rural producers in developing countries. Moreover, resistance to triclabendazole has been reported in sheep infected with *F. hepatica* (Moll *et al*., 2000) [25], suggesting that selection of resistant parasites may eventually compromise the use of this drug. Furthermore, although chemotherapy has been used for more than two decades with some efficacy in reducing morbidity rates, it represents only a palliative measure, leaving transmission rates unaltered due to Continuous re-infection in endemic areas (Dalton *et al*., 2003) [5]. Vaccines represent the most attractive long-term alternative to solve this dilemma, as they represent an environmentally-friendly method for the control of liver fluke disease in livestock.

The detection of infections in ruminants relies on the microscopic observation of *F. hepatica* eggs in the faeces of infected animals. However, early diagnosis by coprological examination is not possible because eggs are not found in the faeces until 10–12 weeks after infection, when flukes reach maturity, and when hepatic injury has been produced (Urquhart *et al.*, 1996) [44]. To prevent this hepatic damage, several immunological methods have been developed for the detection of early and specific antibodies to *Fasciola hepatica*, especially in cattle and sheep (Santiago *et al.*, 1988) [34] but few of them have been focused on goats (Martinez Moreno *et al.*, 1996) [20].

The development of *Fasciola hepatica* in different experimental host species has been reported in different parts of the world (Martinez Moreno *et al.,* 1997; Mendes *et al.,* 2008) [21, 24]. The descriptions by Dawes (1961) [7] are among the first reports of development of *F. hepatica* in a definitive host. The use of mice for evaluating the migration and feeding of the parasite after penetration into the liver led to a detailed description of the different aspects of *F. hepatica* pathogenesis (Dawes, 1963 b; Dawes *et al.*1964) [6, 8]. However, in this model, parasite maturation usually causes death. Rats and rabbits represent suitable models to study the therapeutic and immunological host responses to *F. hepatica* infection (Boray, 1969) [3]. Most studies related to the pathogenesis of fascioliasis focus on the hepatic changes. Reports of injuries in other organs and tissues are quite rare (Sinclair, 1967) [36], and therefore, itis essential for a suitable laboratory model to permit the complete investigation of *F. hepatica* pathogenesis as it migrates into the thoracic and abdominal cavities before penetrating the liver. In the search for a suitable experimental model for *F. hepatica*, (Helfer *et al.,*1968) [13] showed the susceptibility of *Merionesunguiculatus*to infection and reported only hepatic lesions that were similar to those found in other animal models up to 50 days after infection.

Fasciola hepatica and *Fasciolagigantica* or 'liver flukes' are parasitic flatworms causing fasciolosis, a vectorborne disease with the greatest latitudinal, longitudinal and altitudinal dispersal in the world (Mas Coma *et al.,* 2003) [23]. The two species of Fasciola have different environmental niches with *F. hepatica* being found in temperate regions, such as Australia, Great Britain, Europe, the Americas and eastern Africa, while *F. gigantica* is resident in the tropics (South-East Asia, India, the Middle East and sub-Saharan Africa). In some countries with both tropical and temperate zones, the two Fasciola species exist including Japan, the Philippines, Vietnam, Korea, China, India and eastern Africa. Fasciolosis affects all agriculturally important ruminant animals (sheep, cattle, buffalo and goats) and its geographically wide dispersal makes this one of the most important pathogenic helminth diseases worldwide. As parasites of economically important livestock, *F. hepatica* and *F. gigantica* are responsible for global losses conservatively estimated at over US$3 billion each year (Spthill *et al.,*1999), although quantifying financial losses is difficult because of the under reporting of infections and poor diagnostic tests available in the past. Production losses are shown as decreases in milk, meat and wool production, reduced fertility and the draught capacity of working animals (resultingin decreased crop yields), and also include the cost of drugs used to treat fasciolosis, and secondary bacterial infections that arise during liver fluke infection. The parasite is especially prevalent in tropical regions of Asia and Africa, where it is considered the single most important helminth infection of cattle and buffaloes where these ruminants provide 80% of the draught power for crop cultivation (Spithill *et al.,* 1996; Links *et al.,* 2007; Mas- Coma *et al.,* 2009) [40, 39, 19, 22].

The infections caused by helminth parasites are verycommon in ruminants worldwide but principally they are present in areas with enough humidity for the development of free-living stages of the life cycle. The prevalence of some of them can reach 100% in those flocks with grazing animals. The importance of helminth infections is due to the economic losses related with lower growth and milk production as well as liver condemnations. Groups of importance for sheep are the nematode sand trematodes (the most prevalent in Europe, America and Australia), and also the cestodes. Their lifecycles include free-living stages directly influenced by the climate, - principally temperature, rainfalls and humidity- regulating the geographical distribution of some of the species. Recent data suggest that the pattern of helminth infections may be changing.

Conclusion

Fasciola hepatica is a trematode parasite that infects a wide range of mammalian hosts, including domestic ruminants in which fascioliasis is an economically important disease. Goat fascioliasis is considered less frequent and important than goat, sheep or cattle infection but nonetheless occurs as a major constraint for goat production in many areas of the world. The disease usually appears in a chronic form, although cases of acute fascioliasis with high rates of mortality. Economic losses are due to both the mortality arising from clinical processes and the decline in production caused by subclinical processes, in which migration of immature parasites through the liver gives rise to considerable liver damage. At present, control methods are aimed at strategic chemotherapy of parasitized animals and eradication of intermediate snail hosts. To control the disease with greater efficacy it is essential that we gain a better understanding of its epidemiology and improve our knowledge of the immune responses to *F. hepatica*.

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