ISSN: 2831-3887

Editorial

Journal of Veterinary Health Science

Can ruminants become infected with trematode parasites through irrigation?

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Submitted: 2024, Sep 28; **Accepted:** 2024, Oct 08; **Published:** 2024, Nov 26

Citation: Choubisa, S.L. (2024) Can ruminants become infected with trematode parasites through irrigation? *Journal of Veterinary Health Science, 5*(2), 01-04.

Abstract

Although several different species of digenetic trematode (fluke) parasites have been found to infect various species of vertebrates including humans and ruminants. However, the most common species of them are Fasciola spp., Amphistomum spp., Paramphistomum spp., and Schistosome spp. which mostly infect domestic ruminants like cattle, water buffaloes, sheep, goats, and camels and cause various dangerous trematodiases such as fascioliasis, amphistomiasis, paramphistomiasis, and schistosomiasis, respectively. Every year, thousands of ruminants die due to infection of these trematode parasites or trematodiases, adversely affecting the herd owners and the country's economy. These diseases are spread among diverse species of ruminants by their specific vectors, snails (Gastropods: Mollusca) which are commonly found in various freshwater habitats like large ponds, lakes, dams, rivers, etc. In fact, these snails are the intermediate hosts of these trematode parasites and complete their life cycle. Actually, in snails, different larval stages of these trematodes such as sporocyst, radial, and cercarial develop. Among these larvae, cercarial larvae are active and free swimmers. After emerging from the snail, these larvae either penetrate the skin of animals (in case of schistosome trematodes) when they come in contact with water bodies or get deposited on the leaves of aquatic plants as cysts called metacercarial larvae which are highly infective and have amazing ability to survive even in unfavorable environments. During grazing, these metacercarial larvae enter the body of ruminants with food and eventually, they reach their target organs where they start growing and cause trematodiasis. This is a common cause of trematode infection in animals through reservoirs. But it is also possible that large numbers of domestic ruminants may become infected with trematodes simultaneously through irrigation. But this route of trematode infection is rarely known which is the main focus of the present editorial.

Keywords: Cercaria, Infection, Irrigation, Freshwater habitates, Metacercaria, Parasites, Ruminants, Snails, Trematode, Trematodiasis

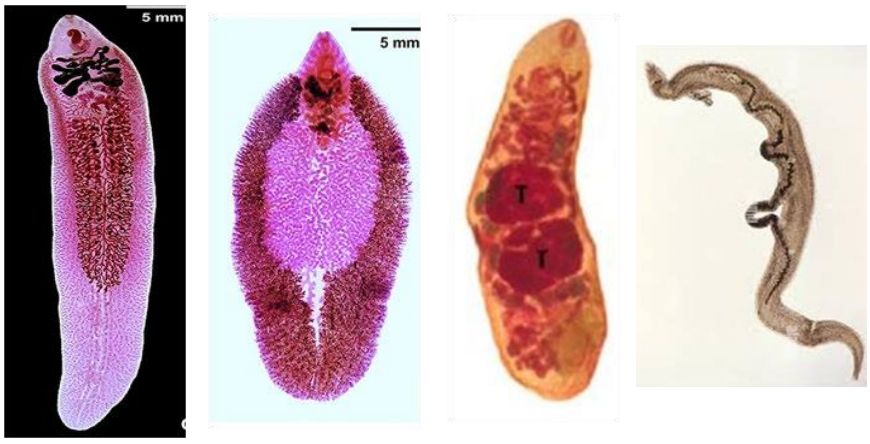
1. Introduction

Irrigation is necessary in agriculture to produce various food grains for humans and fodder for domestic animals. When rainfall is less or water is not available in sufficient quantity, water is supplied through canals from dams, large ponds, and lakes for irrigation of crops. Most of these reservoirs also harbor a wide variety of species of snails belonging to the families Lymnaeid, Planorbid, Thiazide (Melanidae), and Viviparid of the class Gastropod a of the phylum Mollusca. The most common snail species found in various freshwater bodies are *Lymnaea acuminate f. patula, L. acuminate f. chlamys, L. acuminate f. typica, L. acuminate f. rufescens, L. luteola f. australis, L. luteola f. typica, L. luteola f. impura, Gyraulus convexiusculus, Planorbis (Indoplanorbis) exustus, Faunus ater, Melania (Plotia) scabra, Thiara (Tarebia) lineata, Melanoide striatella tuberculata, Vivipara bengalensis* race *gigantica, V. bengalensis* race *mandiensis, etc.* [1-8]. Though these snails look simply, they cause or spread a number of dangerous diseases called trematodiases in domestic ruminants like cattle (*Bos taurus*), water buffaloes (*Bubalus bubalis*), sheep (*Ovis aries*), goats (*Capra hircus*), and camels (*Camelus dromedarius*). These diseases are caused by infection with digenetic trematode parasites in these animals [9,10]. The most common trematodiases in diverse species of ruminants are fascioliasis, amphistomiasis, paramphistomiasis, and schistosomiasis caused by infection with *Fasciola spp*., *Amphistomum* spp., *Paramphistomum* spp, and *Schistosoma* spp., respectively (Figure 1). Thousands of domestic animals are killed every year due to the outbreak of these parasitic diseases caused by trematode infection, which has a profound adverse effect on livestock farmers and the country's economy. It is well known that snails usually live in various water bodies throughout their lives and they keep spreading various types of trematodiasis diseases among the animals grazing in their surrounding areas. But it is also possible that these snails from water bodies also reach various agricultural fields through irrigation water and spread various trematodiases among the ruminant animals grazing there. That is, through irrigation, these snails can spread diseases from one area

to another. This has also been seen in a recent study conducted in northern Tanzania [11]. The present editorial focuses on the fact that irrigation plays an important role in trematode infection in most of the ruminant animals grazing in irrigated areas.

2. Trematode Infection in Ruminants Through Irrigation

Trematode infection in ruminants in any region is possible only if infected snail species with trematode larvae are found in the water bodies of that region. During the rainy season most snails become infected with the miracidium larvae of trematode parasites. In fact, snails are the intermediate hosts of these digenetic trematodes and complete their life cycle. In snails, different larval stages of these trematodes such as sporocyst, radial, and cercarial develop by multiplication through asexual reproduction. Interestingly, these intra-molluscan stages, the sporocysts, radial, and cercarial larvae, are also highly pathogenic to their snail hosts and cause extensive damage to their liver and gonads [12-20]. Among these trematode larvae, cercarial larvae are active and free swimmers [21]. Among the various species of snails, the most common species of cercariae reported are Monostomes, Amphistomes, Echinostomes, Xiphidiao, Farcocercos, and Gymnocephalous [22-36]. Most of the cercarial species are released from their snail hosts in post monsoon and pre-winter [37-41]. After release from the snail, these larvae either penetrate the skin of ruminants on contact with water (in case of schistosome parasites) or get deposited in the form of cysts on the leaves of aquatic plants. These encysted cercarial larvae, commonly known as metacercariae, are highly infective. While grazing aquatic plants contaminated with metaceracariae, these trematode larvae enter the body of ruminant animals along with food (aquatic fodder) and reach their specific organs where they start growing rapidly day by day by eating the tissues of these organs, causing severe damage to these organs. Due to which trematodiasis develops [42]. This is a normal and natural process of the life cycle of trematodes and their infection in animals. But water from various reservoirs is also used for irrigation for agriculture and from these reservoirs various species of snails also reach large areas of various agriculture through water. In irrigation areas or agricultural fields, these snail species also release trematode cercariae into the irrigation water and these cercariae are then deposited as infectious metacercariae on the leaves of crops and grasses. When herds of ruminants consume crop feed or agricultural forage and grass contaminated with metacercariae, these animals get trematode infections. Thus, ruminants living or grazing in irrigated areas are infected with trematode parasites in higher numbers than those living in non-irrigated areas. This was also observed in a recent study conducted in northern Tanzania [11]. This study looked at the prevalence of *F. gigantica*, *Paramphistomes*, *and Schistosoma bovis* in cattle from randomly selected villages in (i) zero grazing (ZZ) (ii) community grazing without irrigation (ZC), and (iii) community grazing with irrigation (ZCI) areas. Based on faecal examination of cattle in these villages (n=241), the prevalence of these trematode parasite infections was 29.7%, 36.0% and 0% in ZZ, 6.3%, 15.0% and 3.8% in ZC and 57.7%, 56.7% and 1.0% in ZCI, respectively. This suggests that irrigation has an important role in the high prevalence and spreading of trematode infection or trematodiasis in large numbers of domestic animals. However, more such studies are needed in different species of ruminants living in irrigated and non-irrigated areas to confirm and understand the mode of infection of trematodes or trematodiasis. Infection of trematodes in this manner is also possible in humans and different species of wild ruminants living in irrigated areas. Hence, special attention needs to be paid to prevent infection of these parasites in animals of irrigated areas. Although prevention and control of trematode infections in ruminants is possible, it is indeed a very difficult goal, as most of these parasites have more than one primary and secondary host.



(a) (b) (c) (d)

Figure 1: The most common digenetic trematode parasites of ruminants, (a) *Fasciola gigantica*, (b) *F. hepatica*, (c) *Amphistome* sp., and (d) *Schistosome* sp.

Conclusion

It is well known that most of the animals grazing and living near various water bodies containing snails of various species are infected with trematode parasites. However, compared to non-irrigated areas, animals living and grazing in irrigated areas are infected with trematode parasites in comparatively higher

numbers. This indicates that irrigation has a potential role in trematode infection in ruminants. People and wild animals living in irrigated areas are also likely to be infected with these parasites. Therefore, it is necessary to take precautions so that these parasites do not cause fatal infection in animals and humans.

References

1. Choubisa, S. L. (1984). *The biology of certain larval trematodes infecting freshwater snails of lakes of Udaipur* (Doctoral dissertation, Ph. D. thesis, Mohanlal Sukhadia University, Udaipur, Rajasthan, India).
2. Rao, N. S. (1989). *Handbook, freshwater molluscs of India* (Vol. 9). Zoological Survey of India.
3. Choubisa, S. L. (1991). Snail hosts of larval trematodes in southern-Rajasthan. *Indian Journal of Parasitology*, *15*(1), 49-51.
4. Choubisa, S. L. (1992). Molluscs as bio-indicators for the trophic stages of lakes and lotic environments. *Bulletin of Pure and Applied Science*, *11*, 35-40.
5. Choubisa, S. L. (2010). Snails as bio-indicators for dreaded trematodiasis diseases. *The Journal of communicable diseases*, *42*(3), 223-226.
6. Choubisa, S. L., & Sheikh, Z. (2013). Freshwater snails (Mollusca: Gastropoda) as bio-indicators for diverse ecological aquatic habitats. *Cibtech Journal of Zoology*, *2*(3), 22-26.
7. Choubisa, S. L., & Sheikh, Z. A New Variety Of Freshwater Snail, Thiara Scabra Var. Choubisai From Rajasthan, India. *Cibtech Journal of Zoology*, *3*(3), 44-46.
8. Chandra, K. A. I. L. A. S. H., Gopi, K., Rao, D., Valarmathi, K., & Alfred, J. (2017). Freshwater Faunal Diversity in India. Zoological Survey of India, Kolkata.
9. Haryanto, H., Larasati, M. D., Nurfadillah, A., Siregar, S., Utami, R. T., Supriyanto, S., ... & Hermiyanti, P. (2023). *Parasitologi*.
10. Bhatia, B. B., Pathak, K. M. L., & Juyal, P. D. (2021). *Textbook of Veterinary Parasitology*. Kalyani Publishers, New Delhi, India.
11. Nzalawahe, J., Kassuku, A. A., Stothard, J. R., Coles, G. C., & Eisler, M. C. (2014). Trematode infections in cattle in Arumeru District, Tanzania are associated with irrigation. *Parasites & Vectors*, *7*, 1-5.
12. Mohandas, A. (1974). The pathological effect of larval trematodes on the digestive glands of four species of gastropods. Folia Parasitology (Prague), 21, 219-224.
13. Choubisa, S. L. (1988). Histological and histochemical observations on the digestive gland of *Melanoides tuberculatus* (Gastropoda) infected with certain larval trematodes and focus on their mode of nutrition. *Proceedings of Indian Academy of Sciences (Animl Sci)*, *97*(3), 251-262.
14. Choubisa, S. L. (1990). Histopathological observations on the digestive gland of *Lymnaea auricularia* infected with larval trematodes. *Proceedings of Indian Academy of Sciences (Anim Sci)*, *99*(5), 363-368.
15. Choubisa, S. L. (1998). Focus on histopathogenesis of trematode larvae. *Journal of Parasitic Diseases*, *22*(1), 57-59.
16. Choubisa, S. L. (2008). Mode of nutrition in pathogenic trematode larvae (redia and cercaria) which infect hepatopancreas of fresh water snails (Mollusca: Gastropoda). *Journal of Parasitic Diseases*, *32*(1), 68-73.
17. Choubisa, S. L., Sheikh, Z., & Jaroli, V. J. (2012). Histopathological effects of larval trematodes on the digestive gland of freshwater snail species, *Vivipara bengalensis and Lymnaea acuminata*. *Journal of parasitic diseases*, *36*(2), 283-286.
18. Choubisa, S. L., & Sheikh, Z. (2013). Parasitic castration in freshwater snail *Melanoides tuberculatus* (Mollusca: Gastropoda). *Proceedings of National Academy of Sciences, India Section B: Biological Sciences*, *83*(2), 193-177. DOI: 10.1007/s40011-012-0133-y.
19. Lal, C. S., & Vishvajeet, J. (2020). Freshwater larval digenetic trematode parasites in India: an epitomised review. *Research Journal of Chemistry and Environment*, *24*(9), 146-156.
20. Choubisa, S. L. (2022). A brief review of parasitic castration in aquatic snails and its contribution in control of diverse vector snail populations and trematodiases in man and animals. *Austin Journal of Infectious Diseases*, *9*(1), 1-6, id1066. https://doi.org/10.26420
21. Choubisa, S. L. (1991). Comparative study on cercarial behaviours and their host specificity. *Indian Journal of Parasitology*, *15*(2), 125-128.
22. Cheng, T. C. (1964). *The biology of animal parasites*. W.B. Saunders Company, Philadelphia and London.
23. Erasmus, D. A. (1972). *The biology of trematodes* (pp. viii+-312). Belfast University Press.
24. Sharma, P. N., & Choubisa, S. L. (1983). Cercaria udaipuriensis n. sp. from fresh water snails, Vivipara bengalensis from Fateh Sagar Lake. *Indian Journal of Parasitology*, *7*(2), 209-212.
25. Choubisa, S. L., & Sharma, P. N. (1983). Histochemical demonstration of cholinesterase in the nervous system of stregeoid metacercaria Tetracotyle lymnaei. *Indian Journal of Parasitology*, *7*(2), 217-219.
26. Choubisa, S. L. (1985). A gymnocephalous cercaria, *Cercaria johrii* n. sp. from fresh water snail, *Melanoides tuberculatus* (Muller), of Fateh Sagar Lake, Udaipur (Rajasthan). *Indian Journal of Parasitology*, *9*(2), 245-247.
27. Choubisa, S. L., & Sharma, P. N. (1985). *Cercaria tewarii* n. sp.(Echinostomatid cercaria) from fresh water snail, *Indoplanorbis exustus* (Deshayes). *Bio-Sci Research Bulletin*, *1*(1-2), 50-53.
28. Choubisa, S. L. (1986). Histochemical demonstration of esterase in certain freshwater larval trematodes with a note on neuroanatomy. *Proceedings of Indian Academy of Sciences (Anim Sci)*, *95*(5), 623-628.
29. Choubisa, S. L. (1988). Neuroanatomy of furcocercous, *Cercaria milleri*. *Current Science*, *57*(7), 402-404.
30. Choubisa, S. L. (1988). In vitro culture of echinostome cercaria, C. tewarii (Choubisa and Sharma, 1985) from metacercaria to vitellogenous stage. *Indian Journal of Parasitology*, *12*(1), 123-128.
31. Choubisa, S. L. (1990). *Cercaria gurayai*, a new Species (Furcocercaria) from the Freshwater Snail,> *Faunus ater*

(Linnaeus). Records of Zoological Survey of India, 87(4), 267-271.
32. Choubisa, S. L. (1992). On a rare cercaria, Cercaria udaipuriensis II n. sp. from the fresh water snail, *Melanoides tuberculatus* (Muller). *Bio-Sci Research Bulletin, 8*(1-2), 13-16.
33. Choubisa, S. L. (2008). Focus on pathogenic trematode cercariae infecting fresh water snails (Mollusca: Gastropoda) of tribal region of southern Rajasthan (India). *Journal of Parasitic Diseases, 32*(1), 47-55.
34. Choubisa, S. L., & Sheikh, Z. (2013). A Rare Trematode Sporocyst From Freshwater Snail, Melanoides Tuberculatus (Muller 1774). *Cibtech Journal of Zoology, 2*(3), 6-9.
35. Choubisa, S. L., Jaroli, V. J., & Sheikh, Z. (2017). First record of a rare transversotrematid cercaria larva (Trematoda: Digenea) from Rajasthan, India: focus on seasonal occurrence and host-specificity of diverse cercariae. *Journal of Parasitic Diseases, 41*(2), 496-502.
36. Agrawal, N., & Pandey, K. C. (2023). Cercarial Fauna of India, Records of the Zoological Survey of India Occasional Paper No., 414: 1-625. (Published by the Director, Zoological Survey of India, Kolkata).
37. Pandey, K. C., & Agarwal, N. (1978). Larval trematodes and their seasonal variations in snails of Kathauta Tal, Lucknow. *Indian Journal of Parasitology, 2*(2), 139-143.
38. Choubisa, S. L., & Sharma, P. N. (1983). Seasonal variation of cercarial infection in snails of Fateh Sagar Lake of Udaipur. *Indian Journal of Parasitology, 7*(1), 111-113.
39. Choubisa, S. L., & Sharma, P. N. (1986). Incidence of Larval Trematodes Infection and Their Seasonal Variations in the Fresh Water Molluscs of Southern Rajasthan. *Records of Zoological Survey of India, 83*(1&2), 69-80.
40. Choubisa, S. L. (1997). Seasonal variation of amphistome cercarial infection in snails of Dungarpur district (Rajasthan). *Journal of Parasitic Diseases, 21*(2), 197-198.
41. Choubisa, S. L. (2002). Focus on seasonal occurrence of larval trematode (cercarial) parasites and their host specificity. *Journal of Parasitic Diseases, 26*(2), 72-74.
42. Choubisa, S. L., & Choubisa, P. (2024). Are Freshwater Sources Safe for the Health of Humans and Domestic Animals in Terms of Deadly Trematodiases. *Med Discoveries, 3*(1), 1-7,1102.