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***Original Article***

# Prevalence of Cercariae Infection in *Lymnaea auricularia* (Linnaeus, 1758) in NorthWest of Iran

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**Abstract**

The pond snail *Lymnaea auricularia* serves as an intermediate host for many digenian species. In West Azerbaijan province, northwestern Iran, the cercariae infection investigation was undertaken in *L. auricularia* from May to November 2010. Of 6759 collected Lymnaeid snails, 370(5.5%) *L. auricularia* snails were identified. Cercariae infection was found in a number of 276 (74.56 %) snails. The results showed that removed cercariae from *L. auricularia* belonged to Echinostomcercariae (96.38 %) and Furcocercariae (3.62 %) which were found in two out of 28 sites during the course of study. In summer and fall, the highest prevalence of cercariae infection was recorded for both identified cercariae. It is concluded that *L. auricularia* could be an important intermediate host of large group digenian trematodes in the region, which is necessary to take consideration in the control program of trematode infection.

**Key words:** Cercariae, *Lymnaea auricularia*, West Azerbaijan , Iran

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## Introduction

Some freshwater snails (in particular *Basomamtophora*) are intermediate hosts of parasitic flukes.[1] The flukes of the order Digenea have a complicated life cycle.[2] Freshwater snails are considered as the first and often also as the second intermediate hosts of parasitic trematode larva (cercariae), thus directly influence the distribution of the larva.[2,3] Snail-transmitted diseases are one of the major groups of parasitic diseases which are established by trematode parasites. Therefore, the examination of the snails makes it possible to gain information about the sources of infection of definitive hosts, and also is the keystone for the elucidation of the trematode fauna in regions of interest.[4,5]

Lymnaeidae (Pond snails) are freshwater gastropods which prefer inhabiting stagnant, slow streaming waters with heavy vegetation.[6]They participate in the life cycle of at least 71 trematode species belonging to 13 different families. They parasitized birds and mammals as definitive hosts.[7] In previous researches, the infection of Lymnaeid snails by larva of *Fasciola spp*. [8-12], *Paramphistomum spp*,[13] *Holostom spp*. [14] *Trichobilharzia spp*. [15] have been reported. In Europe, Erasmus (1972) reported that several species of the genus *Lymnaea spp*. were infected by 29 different cercariae species.[16] Sometimes, the same Lymnaeid species is used by more than one digenean species simultaneously[17]. Forty species of *Lymnaea* snails were described[17]. In Iran, seven species of Lymnaeid snails were reported which *Lymnaea auricularia* (Eared pond snail) is one of the important pond snails.[18] This freshwater snail is a aquaus dextral snail with a conical shell[1] which reported from a different parts of Iran like northwestern Iran.

So far, a few studies have been carried out on the abundance and diversity of cercariae infection in Lymnaeid snails, in particular *L. auricularia*, in Iran. For instance, cercariae infection was reported in *L. gedrosiana* in Khoozestan province,[19,20] *L. truncatula*[21] in Khoozestan and Kurdestan, *L. gedrosiana*[22] and *L. palustris.*[23] In West Azarbaijan province, no study has been undertaken on the abundance of cercariae infection in *L. auricularia* as yet. Thus, the objective of this study was to elucidate the diversity and regional distribution larval digenean trematode infection in *L. auricularia* of different parts of the province.

## Material and Methods

**Study area.** Lymnaeid snails from 28 freshwater habitats including mountainous and low land areas of north, centre and south parts of West Azerbaijan province, northwestern Iran, were examined for cercariae infection from May to November 2010. The province has an altitude of 1,332 m above the sea level (ASL). According to Iranian Meteorological Organization (IMO) average temperature ranges from 9.4°C to 11.6°C (summer: 22.57°C and winter: 13.73°C) with mean annual rainfall of about 300-800mm (summer: 15mm and winter: 115.3mm) and relative humidity of 30 - 80 % (summer: 66 % and winter: 77.7 %). In general, this province has a semi-humid and temperate climate. Geographic Organization of Armed Forces (GOAF) indicated that there are numerous water bodies and reservoirs which together with relatively appropriate environmental factors provide favorable conditions for aquatic creatures, particularly for freshwater snails.

**Collection of Lymnaeid snails and digenean cercariae identification.** Lymnaeid snails were collected from wetlands, ponds, river basins, canals, springs, swamps, pools, streams, ditches and riversides by the same collector in each sampling for 15 min[24]. The snails were put into a plastic screw capped containers containing the water of snail

habitat. Collected snails were transferred alive to the Malacology Lab for snail's specie identification and cercariae infection rate. *L. auricularia* was identified using key identification by Mansourian (1992) and Pfleger (1999). [1,18] The snails were kept alive in an aquarium with optimal temperature and $O_2$ pressure to investigate cercariae infection.

To remove cercariae, *L. auricularia* snails were examined for the presence of released cercariae by shedding method.[25] The snails were individually placed in glass Petri-dish containing 50 ml declorinated tap water. Each Petri-dish was lit for 4-6 h with a 100-W light bulb at a distance of 15 cm so as not to increase water temperature and induce the expulsion of cercariae. If no cercariae shedding observed, snails were crushed under a stereomicroscope by forceps in order to find immature cercariae, sporocyst and/or redia. Collected cercariae or other stages were fixed in absolute ethanol (Merck, Germany) and stained with Azocarmin-Lactophenol.[21] Stained cercariae were identified using systematic key by Frandsen and Christensen (1984).[26]

## Results

***Lymnaeid snails.*** A total of 6759 was collected during the course of study. Of all snails, 370 (5.5 %) *L. auricularia* snails were identified and examined for the presence of cercariae (Fig.2).

***Digenean cercaria infection.*** Cercariae infection was recorded in 74.59 % of identified *L. auricularia* snails (Table1). The cercariae belonged to groups of larva including Echinostomcercariae (96.38 %) and Furcocercariae (3.62 %) (Table 1, Fig.3). The cercariae infections were only recorded in larger (14-18 mm) and mature *L. auricularia* (Fig. 2). Echinostomcercariae was found during the period of study (summer and fall). While cercariae infection rate was for Furcocercariae only in summer (Table1).

***Geographical distribution.*** Infected snails were found in Golestaneh (83.65 %) and Zarrinehrud (19.23 %) in both mountainus and plain areas (Table 1, Fig. 1).

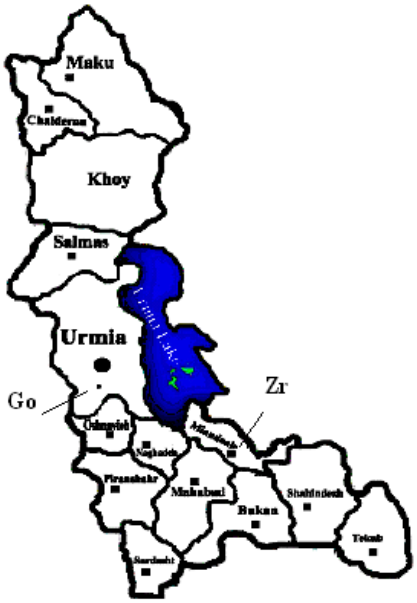


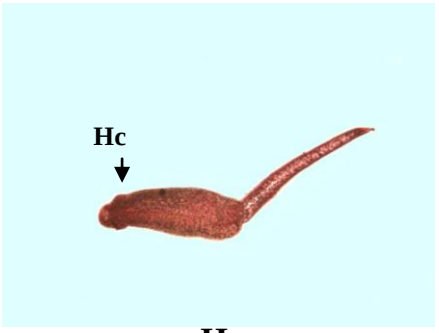

**Fig 1**. Map of the collected *L. auricularia* with cercariae infection in West Azerbaijan province, Iran (Go: Golestaneh, Zr: Zarrinehrud).

**Table1.** Prevalence and geographical distribution of cercariae infection in *L. auricularia* (N = 370) during the course of study in West Azerbaijan province, Iran.

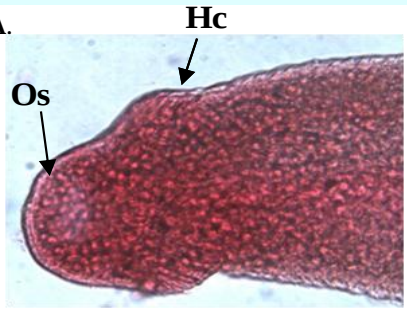
| Identified larva | Place | | | Time | Prevalence (%) | N | n |
|---|---|---|---|---|---|---|---|
| | Gd | Mo | Pl | Season | | | |
| Furcocercariae | Zarrinehrud | - | + | Summer | 32.26 | 31 | 10 |
| | | | | Fall | 0 | 21 | 0 |
| Echinostomcercariae | Golestaneh | + | + | Summer | 30.67 | 75 | 23 |
| | | | | Fall | 100 | 243 | 243 |
| Total | | | | | | 370 | 276 |

Gd: geographical distribution, Mo: Mountainus, Pl: Plain, N: number of examined snail, n: number of infected snail.

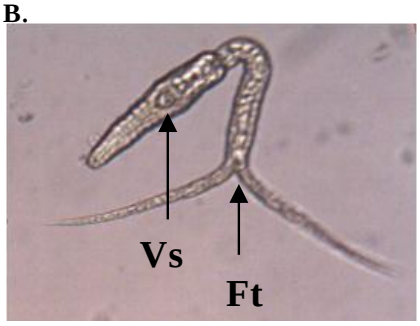
**Fig 2**. Shell of identified snail, *L. auricularia* (Dorsal and ventral position).




**A**.




**B**.




**C.**

**Fig 3**. Echinostomecercariae (**A**, 100× and **B**, 400×) and Furcocercariae (**C**, 100×) removed from naturally infected *L. auricularia* (stained by Azocarmine-Lactophenol, Hc: Head collar, Os: Oral sucker, Ft: Forked tail, Vs: Ventral sucker).

## Discussion

Intra-molluscan trematode parasitism is frequently associated with the alteration of a host's growth, fecundity or survival[31]. A considerable number of studies have attested the potential role of Lymnaeid snails in transmitting the infections by parasitic Trematodes worldwide.[15, 27, 28, 29, 30,31]

In present study, *L. auricularia* snails were found in the province as previous investigation by Mansourian (1992).[18] Cercariae infection in the snail was from two groups of fluke's cercariae (Furcocercariae and Echinostomcercariae). From different countries, infection of *L. auricularia* by cercariae such as Strigeidae, Schistosomatidae, Sanguinicilidae and Notocotylidae,[15] *T. ocellata*[31] and *T. franki*[32] have been reporded. In a recent investigation by Sharif *et al.* (2010) in Mazandaran province, 3.9 % of examined *L. gedrosiana* was infected by four cercariae groups.[6] In Mazandaran province, cercariae infection by Echinostomcercariae was reported from *L. palustris* (1.22 %).[33] Nourpisheh (1998) noted that cercariae infection in *L. gedrosiana* of southwestern Iran was by four groups' fluke larva.[25] In Germany, *L. palustris* and *Radix* (*Lymnaea*) *auricularia* have been introduced as the intermediate host of Echinostomcercariae by Faltynkova and Haas (2006). [15] In general, the presence of digenian larva stages of trematodes in *L. auricularia* indicates the important role of the snail in transmission of parasites at least to aquatic wild birds and probably to the domesticated birds in the studied area.

In this study, the cercariae infection rate was determined in summer and fall. The infection was found in wetlands where various types of wild aquatic-birds were living in. The reason may be due to favorable climatic conditions in the area make it attractive for the birds to migrate and settle during mid spring to late

summer. Thus, a cyclic host-parasite interaction could occur. Sharif *et al.* (2010) reported highly cercariae infection rate was between August-September.[6] The Majority infection rate by schistosome larvae of birds was recorded between May-October.[36] According to Horak *et al.* (2002), the larvae released in spring constitute a source of infection for their definitive hosts returning from their wintering sites.[34] Therefore, the first cercariae developing after the spring infestations of snails could not appear before the presence of the birds. On the other hand, there is a possibility that snails infected by bird's larval trematodes can live throughout the winter by hibernation. This phenomenon was supported by the results of studies on the behavior of *L. stagnalis* in response to temperature.[35]

In conclusion, this is the first step toward providing data on the distribution of parasitic trematodes infection of snails and their potential as intermediate host in the region. This study may provide a valuable basis for designing and launching an all-round control programmed in this area.

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