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Alterations in lipid Contents of Infected and non-Infected Snail Lymnaea Acuminata During Patency Period from Aurangabad (M.S.)

KEYWORDS: lipid, infected non-infected, Lymnaea acuminata, patency

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ABSTRACT *Snails act as an intermediate host for trematode larval parasites. In a parasite – host association there must exist a parasite population density which has the potential to kill the host. Parasitic association then encompasses a degree of metabolic dependence by the parasite on the host. Relatively little information is available with respect to the effect of larval trematode on the lipid concentration of molluscan hosts. As a source of energy, neutral fats or lipids are extremely important in pulmonate snails. Freshwater pulmonate snail Lymnaea acuminata are easily available in and around the city Aurangabad. The primary aim of the investigations is to observe the lipid content of different body components like foot, mantle, hepatopancreas, gonads and male and female accessory sexual organs from both infected and non-infected snail Lymnaea acuminata during patency period. The results are reported in mg/100 mg dry weight of tissue. In present investigation, the lipid contents in infected snails were found to be decreased as compared to non-infected snails.*

Introduction
Parasitism, in the classical sense refers to associations in which there is over exploration of one associate by the other, leading ultimately to severe injury or death (Henry, 1966). Animal stores excess food materials in the form of carbohydrates, proteins and lipids in different body components anticipating the adverse conditions of the environment. During stress conditions these reserved form of energy to counteract the stress. As compare to vertebrate host, little is known regarding the effects of parasitization on the lipid metabolism in invertebrates.

Again the most investigations concern trematode infection. Numerous histological studies have demonstrated that the effect of infection on host lipid level very considerably between parasite host system and are intimately associated with observed histopathology (Reader 1971). Alternations in lipid levels are directly demonstrated by Southgate (1970) in the digestive gland of L. truncatula infected with rediae of Fasciola hepatica. McManus et al., (1975) reported the effects of Microphallus similis sporocysts on the digestive gland lipid metabolism of Littirina saxatilis. Relatively little information is available with respect to the effect of larval trematode on the lipid concentration of molluscan hosts. Earlier reports by Faust (1917) and Hurst (1927) indicated increase in the total lipid in trematode parasitized snails, whereas Von Brand and Files (1947) observed that fat content in B. glabrata parasitized by S. mansoni remained unchanged.

As a source of energy, lipids are extremely important in pulmonate snails (Klobucar et al., 1997). Very recently, Swiderski and Mackiewicz (2004) are of the opinion that at least some parasites, particularly their free living stages and those living in intermediate hosts, can utilize lipids as an energy source. Miroslowa and Rajski (2005) studied effects of the presence of sporocysts, rediae and cercariae of F. hepatica on the lipid content in the digestive gland of L. truncatula as well as lipid levels in the tissues of the parasites themselves.

The primary aim of the investigations to observe the lipid content of different body components like foot, mantle, hepatopancreas, gonads and male and female accessory sexual organs from both infected and non-infected snail Lymnaea acuminata during patency period.

MATERIALS AND METHODS
Collection of snails L. acuminata was done during the months from September to October period of both years (2009-2010) because in this month's there was high rate of infection found. After bringing those to the laboratory, infected snails of normal size (20± 2 mm shell length) were maintained in separated troughs for biochemical study. Food material consisted of lettuce and algal material was provided ad libitum and maintained in dechlorinated tap water for total period of patency.

A batch of non-parasitized snails was maintained simultaneously as control animals. Total period of cercarial release lasts for 7 days is called period of patency. This period is divided into 3 different phases as per the cercarial release:

a) Initial phase of patency (1st and 2nd day)
b) Peak period of patency (3rd, 4th and 5th day)
c) Post phase of patency (6th and 7th day)

50-60 trematode pathogen infected snails along with equal number of non-infected snails were selected for biochemical study. A batch of 10-15 snails during every phase of patency were sacrificed in order to remove their different body components i.e. foot, mantle, hepatopancreas, gonad and male and female accessory sex organs (MASO and FASO) of both infected and non-infected snails. These different tissues immediately were subjected for the estimation of lipids.

First of all the different body tissues were collected in separate watch glasses and were dried in the thermostat oven adjusted at 65- 70^0 C in order to remove water percentage from tissues. The oven dried tissues were grinded in order to get prepared dry powdered form and then subjected for lipid analysis.

The amount of total fats in both infected and non-infected snail body components was estimated with the help of Vanillin Reagent Method developed by Barnes and Blackstock (1973) and the results are expressed in terms of mg/100 mg tissue on dry weight basis.

The biochemical data obtained for all three different phases of patency was subjected to statistical analysis to find out an average value of the data with standard deviation and to analyze the level of significance.

OBSREVATIONS AND RESULTS
Minimum amount of lipid is present in foot muscle

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(6.532±0.762) and maximum (14.878±1.031) in hepatopancreas of non-infected snails. Due to larval trematode parasitic infection, there are drastic changes in lipid contents of hepatopancreas and gonadal tissues during post phase of patency. Changes in the total lipid contents of rest of the tissues studied, gets moderately altered. Least changes are observed in lipid content of foot and mantle tissues after larval trematode infection compare with non-infected snails.

Table 1- Alteration in lipid content of different body tissues of the snail L. acuminata during different phases of patency.

Snail category	Amount of lipid in mg/100mg tissue ± S.D. on dry weight basis during initial phase of patency.					
	Foot	Mantle	Hepatopancreas	Gonad	Male ASO.	Female ASO.
Non-infected	6.684±0.684	7.019±0.132	14.231±1.119	12.132±1.129	7.998±0.832	9.968±0.247
Infected	6.543±0.821	7.002±0.014	10.851±1.523	11.154±0.075	7.008±0.220	9.229±0.834
	Amount of lipid in mg/100 mg issue ± S.D. on dry weight basis during peak phase of patency.					
	Foot	Mantle	Hepatopancreas	Gonad	Male ASO.	Female ASO.
Non-infected	6.532±0.762	7.310±0.314	13.986±0.396	12.337±1.128	7.799±0.770	8.099±0.330
Infected	5.121±0.651	7.127±0.167	9.308±0.513	9.853±1.002	6.699±0.652	7.777±0.339
	Amount of lipid in mg/100 mg tissue ± S.D. on dry weight basis during post phase of patency.					
	Foot	Mantle	Hepatopancreas	Gonad	Male ASO.	Female ASO.
Non-infected	6.771±0.081	7.411±0.056	14.878±1.031	12.888±1.912	7.660±0.676	9.017±0.554
Infected	5.151±0.652	5.558±0.097	7.735±0.211	9.900±0.373	7.178±0.203	6.628±0.715

DISCUSSION

Nutrition plays a fundamental role in all symbiotic associations. The most comprehensive investigations on metabolic alterations during parasitic infection involve larval trematode pathogen infected intermediate gastropod snail hosts. Little is known about the potential role of lipids in trematode- mollusc association. Mollusc actively synthesized and store lipids including sterols, fatty acids and triglycerides (Voogt, 1984). Triglycerides are generally considered as lessor importance than carbohydrates in molluscan energy metabolism, some species including B. truncatus and B. glabrata (Duncan et al., 1987), utilize fat reserves during starvation. The nutritional requirement for lipids in molluscan development is poorly understood. The potential importance of lipid nutrient for intramolluscan trematode development is yet unknown.

Thompson and Lee (1987) demonstrated that the free phosphatide pool of the digestive gland in B. glabrata is significantly reduced in infected snails. During patency period of parasitism in the snail Lymnaea, there is peak in cercarial development in the snail body and also with rapid multiplication of parasites, maybe the cause to have decreased levels of lipid content of hepatopancreas and gonad of the infected snails compared to non-infected ones. This also suggests that rapid parasite absorption of lipid profiles may be responsible for the decline in host lipid levels and the intramolluscan stages of parasites also may have specific lipid requirements for their development. In B. glabrata maintained on various high fat diets after infection with S. mansoni, the time to patency was significantly reduced, reflecting the importance of the intramolluscan lipid profile for the development of the Schistosome trematodes (Thompson et al., 1986).

Southgate (1970) reported that in the pulmonate snail L. truncatula infected by the rediae of F. hepatica, there was an increase in fatty acid content, but a decrease in total lipids. The present results are contradictory to the results of Southgate (1970) who found that the hepatopancreas of L. truncatula the saturated fatty acid palmitic are most abundant followed by the unsaturated oleic acid. These two major unsaturated and saturated fatty acids respectively, generally found in animal lipids (White et al., 1964).

However, in the present probe the total lipids are quantitatively reduced during patency period of the snail, L. acuminata indicating lipids are mobilized early. It is widely known that parasites obtained energy predominantly by catabolism of carbohydrates (Smyth and Halton, 1983), so they deplete the host's carbohydrates reserves at the onset of infection, while the snails draw energy by decomposing lipids.

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