

# HISTOPATHOLOGICAL EFFECTS OF *PARAPLEURO LOPHOCERCOUS CERCARIA* ON THE DIGESTIVE GLANDS *MELANOIDES TUBERCULATA*

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**Abstract** – As they can act as intermediate hosts to various parasitic species, snails have a particular veterinary importance. The study was conducted to investigate the histopathological effects of *Parapleuro lophocercous* larval stages on the digestive glands of *M. tuberculata*. Snails infected with *Parapleuro lophocercous cercaria* were collected, and infected digestive glands were isolated and prepared for histological preparation. Histopathological observation in infected snail tissues showed considerable damage to the digestive gland such as lyses necrosis, enlargement of the epithelial layer and separation of connective tissue. The severity of any histopathological damage depends on the type of larval stages and degree of infection.

## INTRODUCTION

Snails have a particular veterinary importance due to acting as intermediate hosts in the transmission of several species of flukes (Lockyer *et al.*, 2011; Taofiq *et al.*, 2017; Chontanarith *et al.*, 2017). As the snails can harbour to larval stages of Trematodes, these larval stages may cause different forms of histopathological damage and structural alteration to the digestive glands and reproductive systems of infected snails when they grow and multiply (Adam *et al.*, 1995; Probst and Kube 1999; Gilardoni *et al.*, 2018a; Gilardoni *et al.*, 2018b; Huffman *et al.*, 2009; Averbuj and Cremonte, 2010; Chousiba *et al.*, 2012; El Sayed *et al.*, 2014; Omoyakhi and Okhale, 2015) A number of investigations have reported that the hepatopancreas or digestive gland in gastropoda suffer attack more than any other organ (Wright, 1966; Crews and Gerald, 1987). The snail *Melanoides tuberculata* naturally harbours several trematodes, and is known as an intermediate host to them (Pinto and Melo, 2010). Various types of *Cercaria* that emerge from *M. tuberculata* have been reported in Iraq (Al-Husseiny, 1999; Mohammad, 2015). Some histopathological and histochemical observations in *M. tuberculata* infected with larval stages of trematodes have indicated a number of abnormalities in the digestive glands of snails (Choubisa, 1988). In general, histopathological studies of infected snails in Iraq are rare. This study

aims to investigate the histopathological effects of *Parapleuro lophocercous cercaria*, redia and sporocysts on the digestive glands of *M. tuberculata*.

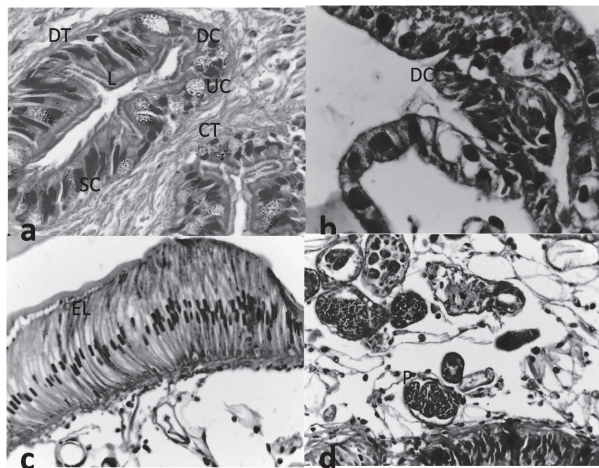
## MATERIALS AND METHODS

About 70 specimens of the snail *Melanoides tuberculata* were collected from the Garmat Ali River in Basrah province in Iraq in the spring of 2018, which were then taken to the laboratory and separated into different aquaria and equipped with fresh water and some aquatic plants from the snails' original habitats. The collected snails were exposed to artificial light for two hours in order to ensure the shading of the cercaria, and the emerging cercaria were fixed and examined under the microscope for identification purposes. The infected snails were separated from their shells then fixed in 10% formalin and prepared for histological examination according to Humason, 1972.

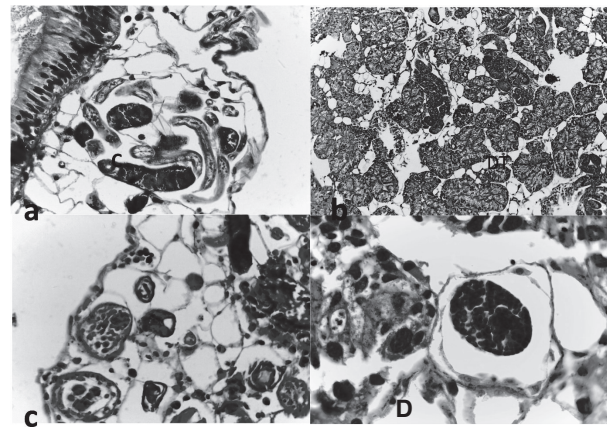
## RESULTS AND DISCUSSION

Out of the 70 collected specimens of *M. tuberculata*, 14 (20%) were infected with *Parapleuro lophocercous cercaria*. Uninfected *M. tuberculata* digestive glands are generally composed of several oral or elongated tubules that are connected to each other by fin loss

connective tissues. Each tubule in the digestive gland has lumen surrounded by a single layer of epithelial cells which can be divided into three types: 1- columnar-ciliated (digestive/absorptive) cells with basal nucleus 2- secretory cells, and 3- undifferentiated (starving) cells, which can be observed in the intestinal component of the digestive gland, with the whole digestive gland enclosed in the outer membrane, the *Tunica propria* (Plate 1a). The infected *M. tuberculata* digestive glands appeared to have undergone considerable damage as caused by *Parapleuro lophocercous* sporocysts, redia and cercaria. In general, the histopathological damage in the infected tissue can be categorized as either mechanical or physiological. Mechanical damage includes degeneration of digestive gland cells and their nuclei (Plate 1- b), elongation in the epithelial cells of the intestine (Plate1- c), a damaged digestive gland architecture (Plate 1- d), and separation of the connective tissue from the epithelial layer of intestine wall (Plate 2- a). The tubules become irregular in shape and there can be an increase in the intertubular and intratubular space of the majority of tubules (Plate 2- b), and hypertrophy and protrusion (Plate 2- c), and infiltration of inflammatory cells and their nuclei (Plates 2- d). Physiological damage has been reported as including lyses in the epithelial tissue of

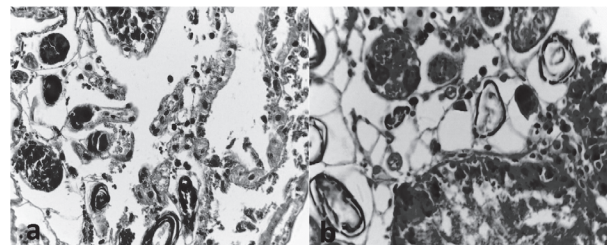


**Plate 1.** a. Histology of uninfected *M. tuberculata* digestive glands  $\times 100$  (b-d): histology of infected digestive gland b: degeneration of digestive gland cells and their nucleus  $100 \times$ , c: elongation in the epithelial cells of the intestine  $40 \times$ , d: destroyed digestive gland architecture  $40 \times$ . DT: digestive tubule, DC: digestive cells, SC: secretory cells, UC: undifferentiated (starving) cells L: tubule lumen CT: connective tissue, EL: epithelial layer, P: parasite.



**Plate 2.a.** Separation of the connective tissue of the intestine wall  $40 \times$ , b: irregular shape of tubules and increase in the intertubular and intratubular space  $10 \times$  c: hypertrophy and protrusion  $40 \times$ , d: infiltration in inflammatory cells and their nuclei,  $100 \times$ . C: cercaria.

intestine (Plates 3- a) and necrosis in the digestive gland epithelial tissue (Plate 3- b). No parasites at the larval stage invade the tubules of digestive gland and some tubules remain unaffected. Damage and alteration to the infected digestive gland are more apparent in heavy infections. Such mechanical alteration and damage to the infected digestive gland are thought to be a result of *Parapleuro lophocercous* larval activities such as gaining nutrition, growth, multiplication and larval movement while physiological damage such as necrosis or lyses may be a result of parasitic secretions of enzymes and their toxic effects during metabolic activities or result from digestive enzymes that are released from ruptured cells in the digestive gland (Choubisa, 1988, 2008). Autolysis may occur due to starvation when food is unable to pass into the digestive tubules due to their compression at different sites, as well as lowering in energy and stored nutrients due to developing in the gonads of infected hosts, which could explain the enlargement



**Plate 3.** a. lyses in the intestine epithelial tissue  $40 \times$ , b: necrosis in the digestive gland's epithelial tissue,  $40 \times$ .

of the intertubular and intratubular space of infected glands (Chousiba *et al.*, 2012).

### CONCLUSION

The infection of snails with trematodes cercaria causes various forms of histopathological damage depending on the degree of parasitaemia, and the size and types of larval stages present.

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