Pathology change of dropsy syndrome in Koi Fish (*Cyprinus carpio*) at IBAT Punten Batu

A Haryo* and R Nurhidayati

Laboratory of Veterinary Pathology, Faculty of Veterinary Medicine, Brawijaya University, Malang 65151, East Java, Indonesia

*Corresponding author: albiruni.haryo@ub.ac.id

**Abstract.** Dropsy can be identified from loose scales from the body of a fish. Dropsy fish are having trouble swimming, breathe, and has a bulging belly. Bad water conditions can trigger Dropsy symptom in Koi fish. The method in this examination, make macroscopic observations that are compared with the literature and proceed by making histopathological preparations with daily routine staining which is then observed microscopically. Number of sample is one fish, sampling with a big population. The purpose of this study is to examine macroscopic and microscopic pathological conditions on fish with dropsy syndrome. The organs examined include the gills, skins, and kidney. Pathological changes that occur in these organs are hyperplasia, telangiectasia, dermatitis, and granuloma nephritis. The conclusion of this research, that Koi fish (*Cyprinus carpio*) positive suspect Dropsy Syndrome.

1. Introduction

Dropsy (gembur/gembung), can be seen through the scales in body of fish. Fish that have this disease will have difficulty in swimming, breathing, and have a swollen stomach. This disease can be identified quickly marked physical characteristics (figure 1). Fish that have loose or dropsy conditions will find it very difficult to swim, due to the swollen body condition so that the fish have difficulty in moving. Bad water conditions can trigger Dropsy symptoms in fish [1]. Koi fish, is one of the potential businesses that have prospects in the specific area of fish business. Health management control in Koi fish is not easy, because if one of the fish have infected with this disease, it has a great potential to transmit to other fish, causing farmers losses economically because the high of mortality [2].

![Figure 1. Koi fish suspected Dropsy Syndrome](image-url)
The emergence of fish diseases is caused by three factors, bad nutrition, carrier agents (pests, parasites, non-parasites, viruses) and the problem of environment. Interaction between the three components causes the fish to be easily stressed, so the fish's show defense, becomes weak and easily infected by disease. In general, mortality of fish caused by infected disease are not caused by carrier agent, but have been in a complication condition. Fish are infected by disease if there is a host, agent or intermediary carrying the disease [3]. The purpose of this research is to determine the pathological changes in the gills, skin and kidneys of fish that suspect Dropsy Syndrome.

2. Materials and methods

2.1. Preparation for examination
The animals used are Koi fish, the history of which is that fish tend to swim to the surface of the water, anorexia, remove and isolated in quarantine ponds. Clinical findings in Koi fish in the fins and tail area appear red spots and scales easily peeled. The animals were necropsed and observed pathological changes in macroscopically method. Before making histopathological preparations, the collection of gills, skin and kidneys are put into 10% formaldehyde.

2.2. Microscope examination
Preparation was made using histotechnical technique, trimming, alcohol dehydration of 70%, 80%, 90%, 96%, 100%, clearing using xylol, paraffin, embedding, sectioning, deparafinization, rehydration, and continued staining using hematoxylin eosin. The preparations are examined under a microscope at magnifications of 40x, 100x and 400x.

3. Results and discussion

3.1. Gills
Based on the results of macroscopic examination, the gills of Koi fish in looks red-pale, there is massive mucus on the gills (figure 2A). After microscopic examination, gills have hyperplasia and erosion of primary lamella and telangiectasia in secondary lamella blood vessels (figure 2B). It can be caused due to contracting from infected fish, fish breeding ponds that use groundwater sources and are less clean [4]. Lamella is a place of oxygen exchange, if there is rupture or damage to the lamella, it will cause circulation problems and gas exchange. Ion exchange in lamella can transfer 60-80% oxygen from water into the blood. The occurrence of such damage will disrupt the circulation system which can cause fish to lack oxygen supply, which in turn will cause a lethal effect on fish due to the disruption of the fish's respiratory system [5]. When water flows through the gills causes the primary lamella to stretch so that the secondary lamella touches one another, this causes the polluted water to come into contact with the lamella, eventually entering the blood capillaries and damaging the tissue in its path [1].

Figure 2. The macroscopic and microscopic of Koi gills. A) Gills looks pale; B) Blood vessel dilation in secondary lamellae (blue arrows) (400x magnification)
3.2. Skin
Based on macroscopic examination of Koi fish, the skin looks neat scales and many scales are peeled-out from the skin (figure 3), whereas on microscopic examination results the histopathological picture of fish skin shows the epidermis and dermis layers, and the blood vessels there is accumulation of mononuclear inflammation cells (figure 4). Infiltration of inflammatory cells is the entry of inflammatory cells into the tissues in response to the body due to disease or toxic agents. Inflammatory cells are an immune response due to the presence of an agent in the body of Koi fish, inflammatory cells will phagocytosis of foreign objects that enter the body, inflammatory cells will go to the site of infection and will fight against cells that have the infection. Histopathological changes due to infiltration of inflammatory cells in normal tissue. The existence of cells and tissues that are damaged, the inflammatory cells will come out of the blood vessels and go to the infiltrated area, so the blood vessel tissue is often found vacuoles.

![Figure 3. The scales look abnormal (peeling out)](image1)

![Figure 4. Epidermal tissue thickening](image2)

3.3. Kidney
Based on the results of macroscopic examination of Koi fish, the kidney looks hemorrhage purpura, blackish red is quite wide (figure 5). Microscopic examination showed that glomerulus was found to be normal because most of the glomerulus was still of the same size but found necrosis area, followed by granulomatous inflammation (figure 6). The inflammatory cells surrounded the kidney tubules, called caseous necrosis. The caseose necrotic tissue is composed of amorphous granular debris, with no structure enclosed in a granulomatous inflammatory ring, the entire area of the tissue is completely transliterated (closed) [6]. Necrosis describes a state of decreased tissue activity, marked by the loss of several parts of the cell one by one from one tissue. The death of cells or tissue that accompanies cell degeneration in every animal life is the final stage of irreversible degeneration [7]. Necrosis of the tubules due to damage to the tubular epithelium results in inhibition of the function of protein reabsorption. Necrosis is cell or tissue death that is irreversible or incurable. The causes of necrosis are quite diverse including bacterial toxins, corrosive chemicals and physical agents such as high temperatures and weakening the ability of blood supply, necrosis is characterized by damage to the nucleus (irregular shape, chromatine condensed, loss of nucleoli).
The symptom characteristic in this case is like Dropsy Syndrome in Koi fish. From the clinical symptoms, they look weak and often swim to the surface, decreased appetite, bruises on the fins and tail area, scales are not neat and easily peeled-out and found another mucus (extra) in the gills, and gills are brittle and pale-red, the kidney has hemorrhage purpura which is quite wide area. The microscopic examination of the organs examined there are also many abnormalities. It can be concluded that Koi fish have hyperplasia in primary lamella cartilage and secondary lamella telangiectasis, dermatitis on the skin, and granulomatous nephritis in the kidney. The clinical symptoms leads that fish infected by bacterial infections or chemical contamination are the movement of the fish to be slow, silent, with unstable swimming [1]. From the clinical symptoms and microscopic findings of this koi fish are thought have Dropsy Syndrome or bloated, marked with scales that start to date from the body of the fish, difficulty in swimming, breathing, and having a swollen in stomach.

The result of the swelling, is caused the fish fins to going up the surface that they would look like pineapple formation. This occurs as a result of mucus in the body cavity, causing swelling. Another result of this symptom is the fish become lazy to move accompanied by breathing problems and reddish pale skin color. The main cause of Dropsy is not yet fully known, but there is a strong suspicion of bacterial infections such as *Aeromonas, Myobacteria*, or parasites such as *Hexamita* and other viruses that simultaneously infect the fish. Apart from viruses and bacteria that cause dropsy also due to kidney infection. Bad water conditions can trigger Dropsy symptoms. Infected fish will retain fluid in body cells and affect the circulatory system. In severe cases, this disease can be deadly for fish in large population.

4. Conclusion
Based on pathological and microscopic examination showed pathological conditions consisting of hyperplasia, telangiectasia, dermatitis, and granulomatous nephritis. Based on the history, clinical findings, and pathological changes, the diagnosis of the disease leads to Dropsy Syndrome Disease.

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