



Histological Changes of Hepatic Coli-Granulomas in Rooster (*Gallus domesticus*) Infected with *Escherichia coli*

Mohammed A. Ali* , Firas A. Alhasson, Thaer. R. Mhalhal , Shireen J.khaleel,
Samerah A. Daaj

Department of Anatomy, Histology and Embryology, College of Veterinary Medicine, University of Basra,
Basra, Iraq.

ABSTRACT

A granulomatous reaction including the accumulation and aggregation of macrophage cells, either alone or in conjunction with epithelial cells, that may combine to produce multinucleated (giant) cells characterizes the chronic inflammatory condition known as hepatic granuloma. Normally, these granulomas have fibrous fibers and lymphocytes encircling them. Hepatic granuloma is linked to *coli bacillosis* caused by *Escherichia coli*, which can spread to various internal organs and result in a systemic lethal disease. In a particular study, the author observed that hepatic granulomas were surrounded by lymphocytes and a zone of macrophage cells. Additionally, fibrosis in the portal area was attributed to *E. coli* infections. Grossly affected livers were found to contain multiple, firm, pale-yellow, spherical masses with numerous nodules. Furthermore, the study revealed the presence of granulomas in at least one or more than one organs, most commonly in the ceca, and often in an organ like the liver. The study also noted that the necrotic lesion was distinguishable from the surrounding areas of heterophils and giant cells in early stages of granulomas.

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E-mail addresses:

mohammed.abbas@uobasrah.edu.iq

ORCID: [0000-0002-4165-0849](https://orcid.org/0000-0002-4165-0849)

firas.alhasson@uobasrah.edu.iq

ORCID: [0000-0002-4836-516X](https://orcid.org/0000-0002-4836-516X)

thaer.mhalhal@uobasrah.edu.iq

ORCID: [0000-0001-6104-8516](https://orcid.org/0000-0001-6104-8516)

shireen.khaleel@uobasrah.edu.iq

ORCID: [0000-0003-2367-9522](https://orcid.org/0000-0003-2367-9522)

samera.abdul_alzahra@uobasrah.edu.iq

ORCID: [0000-0002-7374-7223](https://orcid.org/0000-0002-7374-7223)

* Corresponding author

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INTRODUCTION

The liver, the body's heaviest internal organ, and largest gland possesses a define texture with, distinct edges and boundaries [1]. Functioning and serving as both the body's largest gland ,and a pivotal organ, it acts as a central hub for processing and metabolizing component that enter the bodies [2]. During development, the, The hepatic diverticulum, a protrusion of the ventral gut epithelium, is where the liver formed, which giving rise to not only the liver but also other organs such as;the gallbladders and bile ducts [3]. he liver's vascular system evolves through the differentiation and differentiation between the hepatic artery and the portal vein , and sinusoidal area [4].

Functionally, the liver is pivotal and crucial as a mediator during metabolism of proteins, carbohydrates, and lipids. It also serves like a reservoir for fat soluble vitamins (A, D, E, and K) and glycogen storage. Furthermore, the liver plays a crucial role in detoxification, elimination of toxins, and synthesis of the plasma proteins such as albumin and bile [5]. Positioned strategically within the liver sinusoids, Kupffer cells act as the body's initial defense against external or harmful agents entering the bloodstream via the portal vein, including microorganisms as viruses, bacteria, and unicellular eukaryotes [6].

As a specialized body part and an organ for metabolism, host defense, and immunological role, the liver's unique features and organization enable it to regulate, synthesize, store, secrete, transform, and breakdown various substances in the body. Notably, Kupffer cells, stationed at the forefront of the bloodstream, efficiently screen and capture antigens, causative to the liver's essential roles in immune checking and surveillance [7].

Etiology:

In this study, *Escherichia coli* is the cause of the granuloma illness. Although *Escherichia coli* is a normal part of the microbiota in the intestines of domestic chicken, some strains, known as poultry pathogenic *E. coli* (APEC), have spread to various internal organs and cause coli-bacillosis, a fatal infection characterized by systemic sickness.

MATERIALS AND METHODS

Thirty adults infected birds were got from a local market in Basra city. The animals of the project were sacrificed by beheading. The belly cavity was unfolded, the internal organs were separated and taken away cautiously. The liver and intestine samples; were cleaned in regular saline and preserved for 48 hours in 10% neutral buffered formalin. Hematoxylin and Eosin stains were used to treat and color paraffin sections and the thickness of 5-7 μm [1,8]. The light microscope was used to examine the stained slices.

Detection of granulomatous diseases: within the liver and intestine include: To exclude and

identify the contributing agent, a series of investigations including history, clinical detection, necropsy, laboratory testing, and inspection of specimens (Cotton swabs) acquired from questionable instances are initiated.

The agents responsible for the hepatic granuloma in birds were The gram-negative, non-acid-fast, uniformly stained, non-spore-forming bacilli known as *Escherichia coli* (*E. coli*) can grow both aerobically and anaerobically with variable sizes and forms. All animals that included in this study are infected by *E. coli* (after lab isolated) and other samples that infected with other agents are excluded from study after agent detection methods that mention above.

RESULTS

Gross post-mortem examination:

An affected liver contained multiple, strong, pale yellow, and round shape masses (a lot of nodules) 1 to 3 mm in diameter (Figure.1).

Histological changes:

Hepatic granuloma is a chronic inflammatory disease that characterized by a granulomatous response involving macrophage aggregation and/or epithelioid cell aggregation, which may combine to form multi-nucleated giant cells. Usually, the liver granulomas have a thin layer of strong, fibrous material and lymphocytes (Figure.2).

The granulomas were within the liver representative parenchyma however, were frequently visible by the liver capsule. They are gathered from a necrotic core that is encircled by a confluent layer of heterophils and giant cells, followed by a sizable zone of lymphocytes and macrophages (Figure.3).

In the liver, is an uncommon causation necrosis enclosed by a palisade circle of multi-nucleated giant cells and epithelioid cells. There were many lymphocytes, scattered foci of heterophile side by side to necrotic region and fibrous connective tissue surrounding granuloma (Figure.4). Accumulation of hepatocytes and proliferation of epithelium cells, in bile duct proliferation (Figure.5). Per portal fibrosis and diffuse fibrosis (Figure.6).

Small amount of hepatic granuloma with center necrosis and large amount hepatic granuloma with central necrosis (Figures.7,8). The histological changes of small intestine, was filtration of macrophage ,

lymphocyte, also congested blood vessels, edema and thicken in villi (Figureure.9, 10).Also few small granuloma in the external layer of muscle (Figures.11,12).



Figure.1 Macro graphic of rooster liver showed granuloma nodules (black arrow)

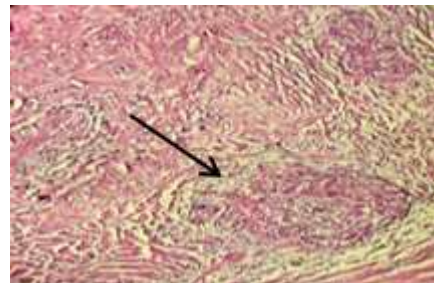


Figure.2 Micro graphic of rooster liver showed a layer of fibrosis (black arrow; H&E stain X200)

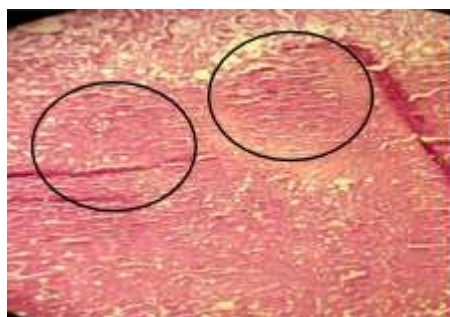


Figure.3 Micro graphic of rooster liver showed the encircled by a confluent layer of heterophils and giant cells Black circle (H&E stain X200)

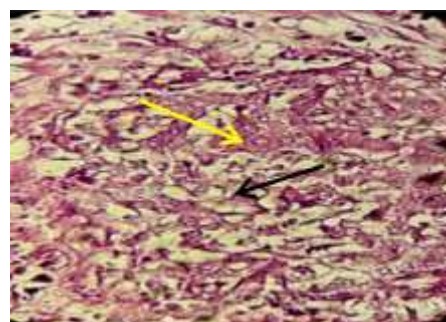


Figure.4 Micro graphic of rooster liver showed the fibrous C.T.(yellow arrow) and the granuloma mass (black arrow; H&E stain X400)

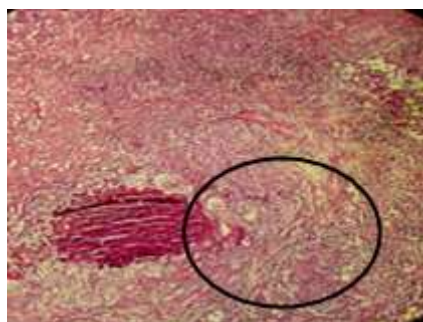


Figure.5 Micro graphic of rooster liver showed a small amount of granuloma (Black circle; H&E stain X100)

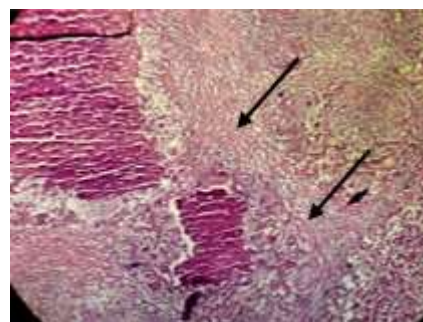


Figure.6 Micro graphic of rooster liver showed a large amount of granuloma mass and fibrosis diffusion (black arrows; H&E stain X200)

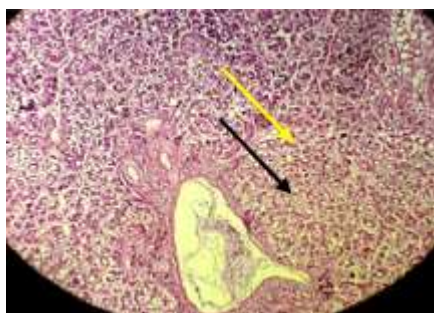


Figure.7 Micro graphic of rooster liver. The necrosis center was shown (black arrow) surrounded by a hepatic granuloma (yellow arrow; H&E stain X40)

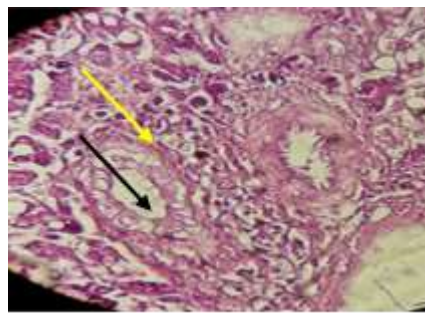


Figure.8 Micro graphic of rooster liver. The necrosis center was shown (black arrow) surrounded by a hepatic granuloma with giant cells (yellow arrow; H&E stain X100)

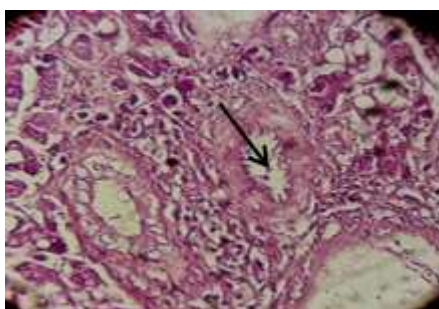


Figure.9 Micro graphic of rooster liver showed the edema and congestion surrounded the B.V. (H&E X200)

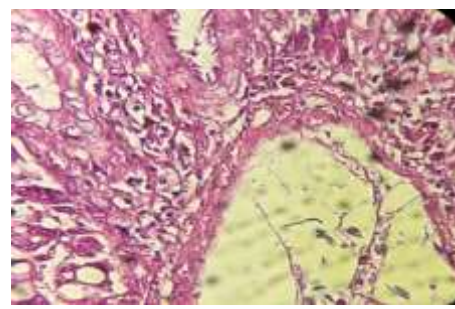


Figure.10 Micro graphic of rooster liver Micro graphic of rooster liver showed the edema and congestion surrounded the B.V. (H&E X400)

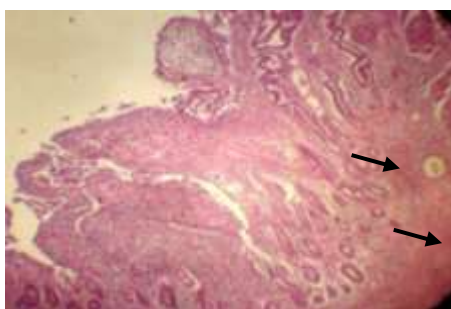


Figure.11 Micro graphic of rooster intestine small intestine showed the little amount of granuloma in external layer (black arrow; H&E X100)

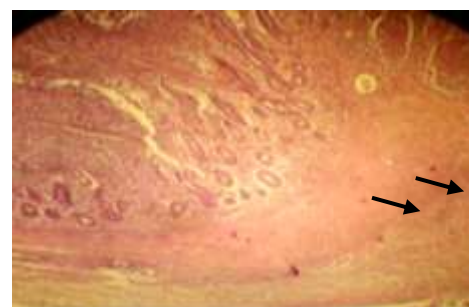


Figure.12 Micro graphic of rooster small intestine showed the little amount of granuloma in external layer (black arrow; H&E X100)

DISCUSSION

Granulomas are aggregates of macrophages, often admixed with other inflammatory cells, which typically are a result of chronic antigen presentation. Many diseases that produce granulomas involve the liver; some are intrinsic hepatic diseases,

whereas others are disseminated systemic diseases that involve the liver as well as other organs. There are several classification schemes that address types of granulomas/granulomatous inflammation, but regardless of the scheme, the morphology of the granulomas may provide clues to the

diagnosis. Hepatic granulomas frequently form in response to bacterial infections such as and noninfectious causes such as In some cases, granulomas may form due to non-infectious causes such as toxins or foreign bodies that provoke a chronic inflammatory reaction.. The presence of bacteria triggers an inflammatory response that leads to the formation of granulomas, characterized by macrophage accumulation and fibrosis. Understanding this link is crucial for diagnosing and managing liver diseases associated with bacterial infections [9]. In this investigation, severely damaged livers exhibited numerous spherical masses, firm in texture and pale-yellow in color, resembling nodules. This observation aligns with previous findings in turkeys, Hepatic granulomas which are a manifestation of chronic inflammation in the liver, often resulting from various infectious or non-infectious etiologies and causes, histopathological features, and implications for disease management. All of previous mentioned where affected livers appeared normal in size and color but harbored multiple pale-yellow masses ranging from pin-point to 3mm in diam, dispersed throughout the hepatic parenchyma [10]. Basically, the current research is different from other studies that have shown granulomas, which are small areas of inflammation, are usually found in organs like the caeca (part of the digestive system) more often than in the liver. This means that current study has found a different pattern of where these inflammation areas are located in the body compared to what other studies have found [11], in contrast to present study of many granulomas in the liver, caeca, duodenum, and mesentery, with no granulomas in the spleen, indicating colibacillosis [6], which are consistent with current observations.

The current study found that they were made up of a bunch of macrophages. Sometimes these macrophages were joined by epithelioid cells, which are a type of cell that helps with immune responses. Occasionally, these cells would come together to form larger cells with multiple nuclei and epithelioid granulomas can be with or without necrosis. These are discrete lesions with distinct edges.

Necrotizing granulomas in infectious disease processes often do not respect the architecture of the liver and may destroy adjacent structures. . This type of response is typical in certain types of infections or diseases [11].

The histological examination of granulomas in current study revealed a granulomatous response characterized by the gathering of macrophages with / without epithelioid cells, occasionally forming multi_nucleated large cells. Notably, hepatic granulomas normally exhibited a encompassing boundary composed of lymphocytes and fibrous tissues, resembling previous reports of fibrous connective tissue encasing granulomas which is in response to bacterial infection, the immune system initiates a granulomatous reaction. This involves the accumulation of macrophages at the site of infection. These macrophages can differentiate into epithelioid cells and may fuse to form multinucleated giant cells. This cellular aggregation is aimed at containing the bacteria and preventing its spread [12,13]. In contrast to other investigations of necrotic, A necrotic center within a granuloma refers to an area of dead or dying tissue at the core of the granulomatous lesion. This phenomenon is significant in the study of granulomatous diseases and can provide insights into the nature of the underlying pathology. Here's a detailed explanation of the necrotic center in granulomas, all of that was not observed in present study, differing from earlier findings in turkeys where necrotic centers were identified adjacent to zones containing heterophils and giant cells within primal time period of granulomas, with inter-cellular bacteria, numerous heterophils, and less number of a giant cells found at the junction contradicting observations in young chicken livers where scattered foci of heterophils were side by side to necrotic places [14 ,15].

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