



## TNF- $\alpha$ and FGF immunohistochemical expressions and pathological evaluation of the duck's liver lesions in Mosul city

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### Abstract

This research focuses on studying liver illnesses in ducks in Mosul city by analyzing the expression of TNF alpha and FGF proteins as indicators of inflammation and abnormal growths in the liver tissues samples were collected from duck liver in Mosul city from November 2022 to November 2023 to detect any pathological changes and occurrences infections. Histopathological observations unveiled abnormalities such as inflammation and extensive tissue damage noted as foci of coagulative necrosis of the hepatocytes, focal infiltration of inflammatory cells, and severe fatty degeneration of the hepatocytes. The results also demonstrated severe massive hydropic degeneration of the hepatocytes, proliferation of Kupffer cells, and expansion of sinusoids. Immunohistochemical tests revealed TNF alpha expression in inflamed regions with a presence in the injured areas, suggesting a robust inflammatory reaction is underway. Conversely, FGF was detected in the regions that demonstrated regrowth, highlighting its vital role in fibrous tissue restoration. The histopathological changes among ducks soared to 52%, indicating an occurrence of liver disorders within the duck population. This research offers information about liver lesions in ducks in Mosul City and helps enhance our understanding of the causes and signs of diseases affecting them. The immunohistochemical results concerning TNF alpha and FGF provide insights into disease progression processes, potentially setting the stage for better treatment and prevention strategies.

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### Introduction

Liver ailments pose a health concern for poultry. They have implications for their overall well-being, productivity, and a range of vital bodily functions the liver governs, including metabolism and immunity regulation (1). Any harm or inflammation to this organ can disrupt the birds' health and their ability to fight illnesses due to its functions in energy storage and detoxification (2). Changes in liver tissue due to pathogens, infections, and inflammation play a role in evaluating damage and disease progression within the organ system (3). These alterations involve disturbances in liver cells' normal functioning and inflamed blood vessels and dead tissues, which collectively affect the liver's functioning (4). Research indicates that such alterations are frequently triggered by acute or long-term reactions

prompted by bacteria, viruses, and external factors like pollution and inadequate nutrition (5). Cytokines, such as TNF alpha, play a role in understanding how the liver's immune system responds to injury (6). Tumor necrosis factor alpha (TNF- $\alpha$ ) is a cytokine that triggers tissue inflammation and is released by blood cells and damaged liver cells when an injury occurs (7). This substance increases the permeability of blood vessels to help more immune cells reach the affected area and combat infections or injuries (8). However, although this reaction offers some protection, heightened levels of TNF alpha can result in inflammation and permanent harm to tissues, adversely impacting liver functions (9).

Keeping track of TNF alpha through methods may prove beneficial in gauging the level of inflammation and the severity of the response (10). An important protein known as

the fibroblast growth factor (FGG) promotes cell growth and aids tissue healing after an injury. Increased levels of FGG in the liver are believed to be the body's way of responding to damage and assisting in the repair of tissues (11). In liver cells harmed or injured, other hepatic cells grow and multiply to compensate for the loss, promoting this process through FGG (12). It also helps to create blood vessels that deliver the necessary oxygen and nutrients to that area of the body, which is crucial for its recovery following injuries or illnesses, in the liver (13). Studying liver diseases in ducks in Mosul is important due to the factors that can harm birds, such as pollution and unsustainable farming practices, which are prevalent in the region and negatively affect their health. Research on liver diseases in duck areas is limited locally; hence, this study is crucial for understanding disease occurrence within the region (14,15).

Immunohistochemical staining techniques provide in-depth insight into the changes linked to liver damage by allowing the investigation of specific proteins involved in tissue inflammation and cell renewal processes. The analysis of TNF alpha and FGF using Immunohistochemistry is a method for obtaining information that aids in assessing liver health conditions. This helps researchers identify strategies to effectively prevent and manage disease prevalence in ducks and enhance their productivity. This study aims to examine the frequency of liver abnormalities in ducks using histopathology and analyze TNF alpha and FGF proteins with Immunohistochemistry to understand disease severity and its consequences.

## Materials and methods

### Ethical approval

Ethical approval was granted by the College of Veterinary Medicine at the University of Mosul, with the approval number UM.VET.2022.093 dated 01/11/2022.

### Duck samples

The research involved 25 ducks collected from various areas of Mosul City, which were examined for signs of liver disease. Those displaying symptoms were selected and taken to the Mosul University College of Veterinary Medicine research lab for testing. From November 2022 to November 2023, 25 adult ducks of different genders weighing between 2 to and 3 kilograms and aged between 1 and 1.5 and a half years were chosen from various areas in Mosul city. Veterinarians from the University of Mosul carefully assessed the ducks for signs of liver disease by observing symptoms such as skin tone changes and abdomen swelling, which may indicate health issues related to the liver.

### Liver sample collection

After gently putting down the ducks to end their suffering and prevent the further spread of infection in the flock, we gathered samples of their livers and carefully transported

them to the Poultry Disease Laboratory at the Veterinary Teaching Hospital at the University of Mosul for further analysis. The samples are processed according to established procedures to maintain their integrity. Then, it is prepared for detailed examination using histological and immunohistochemical techniques. The infection rate was calculated using the following formula; Infection rate = (Number of infected ducks / Total number of ducks examined)\*100.

### Histopathological examination and staining preparation

The liver tissue samples were prepared for assessment using fixation techniques and staining processes with hematoxylin and eosin (15). This enabled the observation of histopathological changes in liver tissues (16).

### Scoring system of the pathological changes

The data presented in table 1 reflect the histopathological changes categorized into five main parameters: cell injury, circulatory disturbances, cell adaptation, inflammation, and an increase in fibrous connective tissue. These changes were scored based on their severity (17).

Table 1: Ordinal descriptive scoring system for severity of histopathological changes severity in duck liver

Histopathological changes	Lesions	Score
- Cell injury		
1- Degeneration	No	0
2- Necrosis		
- Circulatory disturbances		
1- Edema	Mild	1
2- Congestion		
3- Hemorrhage		
- Cell adaptation		
1- Atrophy	Moderate	2
2- Hyperplasia		
3- Metaplasia		
- Inflammation	Severe	3
- Fibrous tissue		

### Immunohistochemistry IHC of TNF alpha and FGF

The immunohistochemistry test was performed to identify the expression of TNF alpha and FGF expression in liver tissues using antibodies located in these proteins according to the staining protocol by the Dako® EnVision™ FLEX system. This study's immunohistochemical detection of TNF alpha and FGF was conducted using a FLEX Polyclonal Mouse Anti-avian antibody (Dako® EnVision™ FLEX system). Tissue sections were prepared on positively charged slides, baked overnight at 60°C, and deparaffinized in xylene, followed by rehydration in graded ethanol. The sections were then treated with hydrogen peroxide to inhibit endogenous peroxidase activity and washed with PBS. A protein block was applied to prevent non-specific binding,

followed by the primary antibody Anti-TNF alpha and FGF, diluted 1:200), incubated for 90 minutes. After washing, a biotinylated secondary antibody was added and incubated for 20 minutes, then streptavidin peroxidase and further PBS washes. The chromogen DAB, diluted with substrate, was added to visualize the antibody-antigen complex. Finally, slides were counterstained with Harris Hematoxylin, washed, and the cover slipped using an aqueous mounting medium.

## Results

### Infection rate

The study revealed that 52% of ducks in the area were affected by liver diseases, indicating the presence of these health issues within the duck community.

### Liver histopathology

Upon examination of the liver samples under a microscope and analysis of the tissue structure, signs of damage and inflammation over time in the liver tissue were revealed, such as obvious foci of coagulative necrosis of the hepatocytes, focal infiltration of inflammatory cells, and severe fatty degeneration of the hepatocytes (Figure 1). The results also demonstrated severe massive hydropic degeneration of the hepatocytes, necrosis of other tissue, infiltration of inflammatory cells surrounding the portal area, proliferation of Kupfer cells, and expansion of sinusoids (Figure 2 and Table 2).

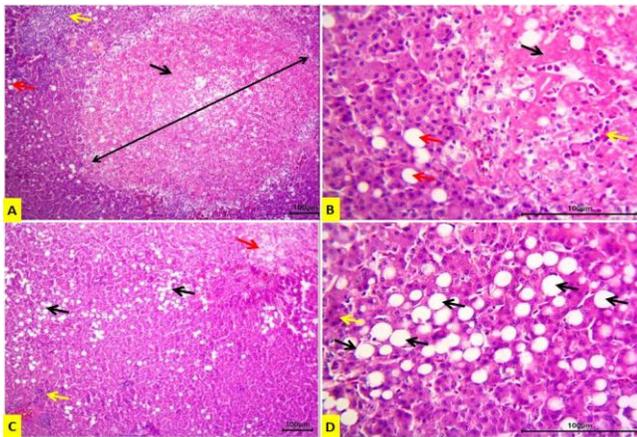


Figure 1: Photomicrograph of duck's liver. (A&C): Congestion and expansion in the sinusoids, with hemorrhage in the liver tissue, obvious focus (two heads arrow) of coagulative necrosis of the hepatocytes (black arrow), focal infiltration of inflammatory cells (yellow arrow), and fatty degeneration of the hepatocytes (red arrow). (B&D): severe fatty change of the hepatocytes (black arrow), necrosis of the hepatocytes (red arrow), and infiltration of inflammatory cells (yellow arrow). (A&B: 100X), (C&D: 400X). H&E stain.

### Liver histopathological changes

The histopathological severity scores for liver changes in ducks were assessed and summarized in table 2. The table provides scores as the median and interquartile range (IQR) for various pathological changes and these significance levels. Degeneration was rated moderate with a median of 2 (IQR: 1.5), indicating consistent tissue damage throughout the samples. Fatty Change and Necrosis: Both were scored as mild with a median of 1 (IQR: 2.5). However, the high IQR variability suggests some severity variability across samples. Edema scored as zero with a median of 0 (IQR: 1), indicating minimal or no observable tissue swelling. Congestion of blood vessels rated as moderate with a median of 2 (IQR: 1.5), indicating significant vascular changes in the liver. Hypertrophy was rated null with a median of 0 (IQR: 1), suggesting no hypertrophic changes in the liver tissues. Hyperplasia scored mild with a median of 1 (IQR: 1.5), showing slight cellular adaptation through proliferation. Acute inflammation rated as mild with a median of 1 (IQR: 2), indicative of mild yet consistent acute inflammatory changes. Chronic inflammation was rated as null with a median of 0 (IQR: 1), showing no chronic inflammatory patterns. The increase in fibrous tissue scored mild with a median of 1 (IQR: 1.5), indicating mild fibrotic changes in the liver.

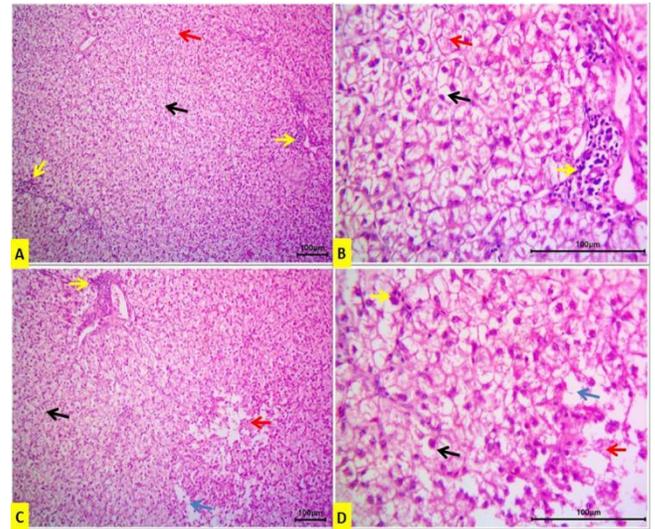


Figure 2: Photomicrograph of duck's liver. (A&B): the inflammatory cells infiltrate around the central vein and not the portal area, severe massive hydropic degeneration of the hepatocytes (black arrow), necrosis of others (red arrow), and infiltration of inflammatory cells surrounding the portal area (yellow arrow). (C&D): the blue arrow indicates the presence of necrosis and not expansion of the sinusoid, severe hydropic degeneration (black arrow) and severe necrosis of the hepatocytes (red arrow), proliferation of Kupfer cells (yellow arrow), and expansion of sinusoids (blue arrow). (A&C: 100X), (B&D: 400X). H&E stain.

Table 2: Scores of ordinal descriptors for the severity of histopathological changes in the duck's liver

Pathological changes	Lesions	Score
Injury	Degeneration	Moderate 2 (1.5) <sup>A</sup>
	Fatty change	Mild 1 (2.5) <sup>B</sup>
	Necrosis	Mild 1 (2.5) <sup>B</sup>
Circulations	Edema	Null 0 (1) <sup>B</sup>
	Congestion	Moderate 2 (1.5) <sup>A</sup>
Adaptation	Hypertrophy	Null 0 (1) <sup>B</sup>
	Hyperplasia	Mild 1 (1.5) <sup>B</sup>
Inflammation	Acute	Mild 1 (2) <sup>B</sup>
	Chronic	Null 0 (1) <sup>B</sup>
Fibrosis	Fibrous tissue	Mild 1 (1.5) <sup>B</sup>

Data expressed as Median and Inter-Quartile-Range. N= 25. Different letters mean there is a significant difference at P≤0.05.

**Immunohistochemical changes for TNF-alpha and FGF**

The immunohistochemical staining revealed TNF alpha levels in the inflamed regions, with a presence in the affected areas signifying a robust inflammatory reaction. On the contrary, FGF exhibited weak expression levels in regions demonstrating cell regeneration and fibrous tissue growth (Figures 3 and 4).

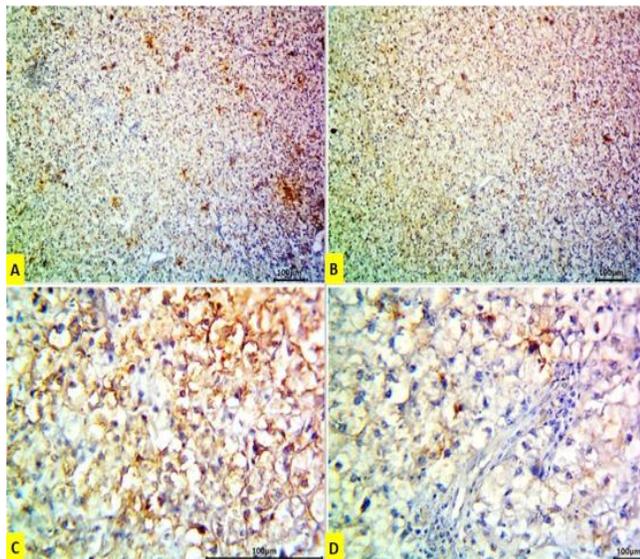


Figure 3: Photomicrograph of duck's liver. [A&C]: immunohistochemical expression of the TNF reveals intense expression (score 3+). [B&D]: immunohistochemical expression of the FGF reveals weak expression (score 1+). (Dark brown is a positive reaction). [A&B: 100X], [C&D: 400X]. Hematoxylin.

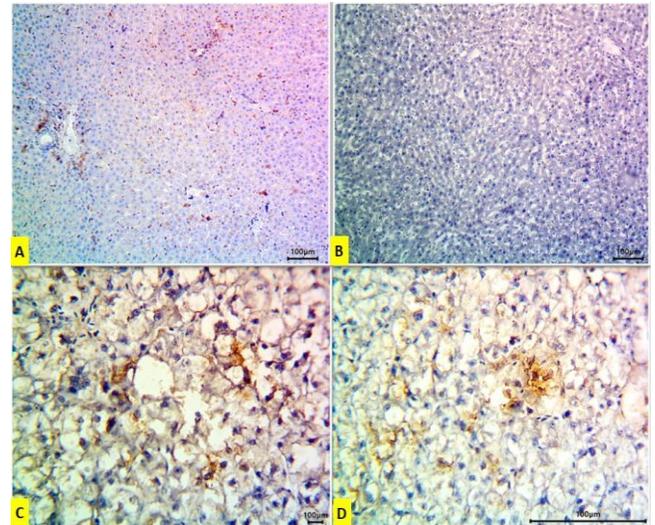


Figure 4: Photomicrograph of duck's liver. (A&C): immunohistochemical expression of the TNF reveals moderate expression (score 2+). (B&D): immunohistochemical expression of the FGF reveals weak expression (score 1+). (Dark brown is a positive reaction). (A&B: 100X), (C&D: 400X). IHC TNF.

**Discussion**

This research indicates that ducks residing in Mosul city, Iraq, have a liver disease occurrence rate of about 52%. This percentage signifies the presence of liver abnormalities within the duck population and highlights the necessity of investigating potential causes and environmental factors that could further exacerbate this issue (18). The results indicate that the duck liver experienced significant histopathological changes, with degeneration and vascular congestion being the most prevalent. Conversely, edema and chronic inflammation were either absent or mild. This suggests the presence of environmental or pathological stress on the liver, which can greatly affect its vital functions. These findings underscore the necessity of monitoring histopathological changes to identify underlying causes and formulate appropriate therapeutic strategies (19,20).

Upon examination, it was observed that ducks experiencing health issues displayed abnormalities in their liver tissues, such as persistent inflammation and extensive damage to hepatocytes. These changes indicate that the liver is under strain, likely caused by an infection that has triggered a prolonged response or repeated episodes of inflammation over time (20,21). The microscopic findings suggest that the liver is facing challenges, possibly stemming from infections or exposure to environmental toxins, resulting in gradual deterioration and harm to the tissue over an extended period (22).

Furthermore, hypertrophy, congestion of liver blood vessels, and blockage were signs of blood circulation in the

liver. This vascular congestion often results from stress on the liver due to efforts to combat pathogens or toxins, resulting in the widening of hepatic vessels and damage to their walls (23). Gathering cells near blood vessels suggests the system's reaction to liver inflammation is an ongoing response to infection or long-term inflammation that may further harm liver tissues (23-25).

The immunostaining results revealed TNF alpha protein levels in areas affected by inflammation, indicating inflammatory activity in those regions. In response to injury and infection, TNF alpha, a cytokine, is secreted by immune cells (26). Its primary function involves stimulating cells and enhancing blood flow to the affected site, allowing defensive cells to reach it. However, the prolonged increase in TNF alpha levels observed in the samples can lead to persistent inflammation, damaging liver tissue and hindering the liver's recovery capacity (27). The results underscore the function of TNF alpha in this process; while it serves as an initial barrier against infections when present at normal levels, the body's defense mechanisms may be compromised if it remains elevated for an extended period. This can result in prolonged inflammation that negatively impacts liver health (28). The higher TNF alpha levels could also suggest that the liver is having difficulty combating threats from pathogens, leading to persistent inflammation and gradual deterioration of tissue quality (29).

In contrast to that finding, researchers discovered levels of the growth factor FGF in certain liver zones where cell growth was active. This observation signifies the body's efforts to mend injured tissues by triggering cellular renewal and promoting the formation of fibrous tissue and new blood vessels, crucial for tissue repair and nourishment (30,31). Elevated levels of FGF found in damaged areas of the liver indicate that the liver is attempting to heal and renew the affected tissue as a response to inflammation-induced damage (32).

However, this regeneration process might be inadequate or restricted due to inflammation, as shown by increased TNF alpha levels, suggesting that the repair attempts may not be sufficient to combat the damage (33). The significant occurrence of infection, 52%, provides evidence of the prevalence of liver ailments in ducks, suggesting that these birds encounter various environmental factors or infections that negatively affect their liver health. Potential contributors may include nutrition, pollution, the environment, or the existence of agents leading to liver inflammation (34).

The high infection rate may result from a combination of factors such as diet and contaminated water, which can directly impact health. Pollution levels in the environment are closely linked to increased occurrences of liver diseases alongside inadequate healthcare and poor hygiene practices that elevate birds' exposure to diseases, ultimately leading to long-term liver inflammation issues (35,36). The results underscore the importance of taking steps to control the transmission of liver ailments in ducks (37). The suggestions

include improving animal healthcare practices by maintaining cleanliness standards and providing nutrition to reduce pathogen exposure and counteract the impact of detrimental environmental elements (38).

## Conclusion

This research offers information about liver issues in ducks in Mosul city, which helps us better comprehend the reasons for and signs of the illness. The TNF alpha and FGF immunohistochemical expression findings provide insight into the disease's progression mechanisms, which might lead to treatment and prevention strategies.

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## Conflicted interest

The author does not have any financial or personal information about individuals or organizations that would improperly influence the article's content.

## References

1. Ullah MI, Alameen AA, Al-Oanzi ZH, Eltayeb LB, Atif M, Munir MU, Ejaz H. Biological role of zinc in liver cirrhosis: An updated review. *Biomed*. 2023;4;11(4):10-94. DOI: [10.3390/biomedicines11041094](https://doi.org/10.3390/biomedicines11041094)
2. Oke OE, Akosile OA, Oni AI, Opopoye IO, Ishola CA, Adebisi JO, Odeyemi AJ, Adjei-Mensah B, Uyanga VA, Abioja MO. Oxidative stress in poultry production. *Poult Sci*. 2024;25:104-003. DOI: [10.1016/j.psj.2024.104003](https://doi.org/10.1016/j.psj.2024.104003)
3. Surai PF, Kochish II, Fisinin VI, Kidd MT. Antioxidant defense systems and oxidative stress in poultry biology: An update. *Antioxidants*. 2019;22;8(7):235. DOI: [10.3390/antiox8070235](https://doi.org/10.3390/antiox8070235)
4. Rangaswamy C, Mailer RK, Englert H, Konrath S, Renné T. The contact system in liver injury. *Semin Immunopathol*. 2021;43:507-517. DOI: [10.1007/s00281-021-00876-7](https://doi.org/10.1007/s00281-021-00876-7)
5. Kumar P, Singh AB, Arora T, Singh S, Singh R. Critical review on emerging health effects associated with indoor air quality and sustainable management. *Sci Total Environ*. 2023;10:872:162-163. DOI: [10.1016/j.scitotenv.2023.162163](https://doi.org/10.1016/j.scitotenv.2023.162163)
6. Casulleras M, Zhang IW, López-Vicario C, Clària J. Leukocytes, systemic inflammation and immunopathology in acute-on-chronic liver failure. *Cells*. 2020;9(12):26-32. DOI: [10.3390/cells9122632](https://doi.org/10.3390/cells9122632)
7. Wang H, Xi Z, Deng L, Pan Y, He K, Xia Q. Macrophage polarization and liver ischemia-reperfusion injury. *Int J Med Sci*. 2021;18(5):1104. DOI: [10.7150/ijms.52691](https://doi.org/10.7150/ijms.52691)
8. Kim K, Mahajan A, Patel K, Syed S, Acevedo-Jake AM, Kumar VA. Materials and cytokines in the healing of diabetic foot ulcers. *Adv Ther*. 2021;4(9):2100075. DOI: [10.1002/adtp.202100075](https://doi.org/10.1002/adtp.202100075)
9. Rostami M, Farahani P, Esmaelian S, Bahman Z, Fadel Hussein A, Alrikabi HA, Hosseini Hooshiar M, Yasamineh S. The role of Dental-derived stem cell-based therapy and their derived extracellular vesicles in post-COVID-19 syndrome-induced tissue damage. *Stem Cell Rev Rep*. 2024;1-42. DOI: [10.1007/s12015-024-10770-y](https://doi.org/10.1007/s12015-024-10770-y)
10. Benchabane S, Sour S, Zidi S, Hadjimi Z, Nabila L, Acheli D, Bouzenad A, Belguendouz H, Touil-Boukoffa C. Exploring the relationship between oxidative stress status and inflammatory markers

- during primary Sjögren's syndrome: A new approach for patient monitoring. *Int J Immunopathol Pharmacol.* 2024;8:38-45. DOI: [10.1177/03946320241263034](https://doi.org/10.1177/03946320241263034)
11. Hamar P. Local Production of Acute Phase Proteins: A Defense Reaction of Cancer Cells to Injury with Focus on Fibrinogen. *Int J Mol Sci.* 2024;25(6):34-35. DOI: [10.3390/ijms25063435](https://doi.org/10.3390/ijms25063435)
  12. Simurda T, Brunclikova M, Asselta R, Caccia S, Zolkova J, Kolkova Z, Loderer D, Skornova I, Hudecek J, Lasabova Z, Stasko J. Genetic variants in the FGB and FGG genes mapping in the beta and gamma nodules of the fibrinogen molecule in congenital quantitative fibrinogen disorders associated with a thrombotic phenotype. *Int J Mol Sci.* 2020;21(13):16-46. DOI: [10.3390/ijms21134616](https://doi.org/10.3390/ijms21134616)
  13. Niranjan S, Narayanan J, Tamilanban T, Subramaniyan V, Chitra V, Fuloria NK, Wong LS, Ramachawolran G, Sekar M, Gupta G, Fuloria S. Exploring the contribution of pro-inflammatory cytokines to impaired wound healing in diabetes. *Front Immunol.* 2023;14:216-321. DOI: [10.3389/fimmu.2023.1216321](https://doi.org/10.3389/fimmu.2023.1216321)
  14. Liebhart D, Bilic I, Grafl B, Hess C, Hess M. Diagnosing infectious diseases in poultry requires a holistic approach: A review. *Poult.* 2023;2(2):252-80. DOI: [10.3390/poultry2020020](https://doi.org/10.3390/poultry2020020)
  15. Al-Sabawy HB, Rahawy AM, Al-Mahmood SS. Standard techniques for formalin-fixed paraffin-embedded tissue: A pathologist's perspective. *Iraqi J Vet Sci.* 2021;35:127-135. DOI: [10.33899/ijvs.2021.131918.2023](https://doi.org/10.33899/ijvs.2021.131918.2023)
  16. Al-Mahmood SS, Khalil KW, Edreesi AR. Histopathology and Immunohistochemistry of tumors in animals attending veterinary teaching hospital. *Iraqi J Vet Sci.* 2022;36(2):309-14. DOI: [10.33899/ijvs.2021.130114.1733](https://doi.org/10.33899/ijvs.2021.130114.1733)
  17. Gibson-Corley KN, Olivier AK, Meyerholz DK. Principles for valid histopathologic scoring in research. *Vet Pathol.* 2013;50(6):1007-15. DOI: [10.1177/0300985813485099](https://doi.org/10.1177/0300985813485099)
  18. Alrahal HH, Al-Tae SK, Sultan GA. I See Inside semi quantitative analysis of nutritional disturbances lesions in the liver and breast muscle of broiler during the starter period. *Iraqi J Vet Sci.* 2024;38(3):485-92. DOI: [10.33899/ijvs.2024.145162.3358](https://doi.org/10.33899/ijvs.2024.145162.3358)
  19. Al-Alhially AA, Al-Hamdany EK, Ismail HK. Investigation of histopathological alteration of paramyxovirus-1 in naturally infected racing pigeons. *Iraqi J Vet Sci.* 2024;38(2):309-16. DOI: [10.33899/ijvs.2023.142395.3177](https://doi.org/10.33899/ijvs.2023.142395.3177)
  20. Esteves F, Rueff J, Kranendonk M. The central role of cytochrome P450 in xenobiotic metabolism—a brief review on a fascinating enzyme family. *J Xenobiot.* 2021;11(3):94-114. DOI: [10.3390/jox11030007](https://doi.org/10.3390/jox11030007)
  21. Al-Hamdany EK, Al-Mallah KH, Ismail HK. Histopathological evaluation of lesions induced by dimethyl hydrazine in male rats. *Iraqi J Vet Sci.* 2022;36(1):115-21. DOI: [10.33899/ijvs.2022.135760.2515](https://doi.org/10.33899/ijvs.2022.135760.2515)
  22. Matyas C, Haskó G, Liaudet L, Trojnar E, Pacher P. Interplay of cardiovascular mediators, oxidative stress and inflammation in liver disease and its complications. *Nat Rev Cardiol.* 2021;18(2):117-35. DOI: [10.1038/s41569-020-0433-5](https://doi.org/10.1038/s41569-020-0433-5)
  23. Luo X, Nicoară-Farcău O, Magaz M, Betancourt F, Soy G, Baiges A, Turon F, Hernández-Gea V, García-Pagán JC. Obstruction of the liver circulation. In: Taniguchi T, Lee SS, editors. *Cardio-Hepatology*. UK: Academic Press; 2023. 65-92 p. DOI: [10.1016/B978-0-12-817394-7.00004-8](https://doi.org/10.1016/B978-0-12-817394-7.00004-8)
  24. Chen Y, Pu W, Maswikiti EP, Tao P, Li X, Wang D, Gu B, Yu Y, Gao L, Zhao C, Chen H. Intestinal congestion and reperfusion injury: damage caused to the intestinal tract and distal organs. *Biosci Rep.* 2021;41(9):15-60. DOI: [10.1042/BSR20211560](https://doi.org/10.1042/BSR20211560)
  25. Peiseler M, Schwabe R, Hampe J, Kubes P, Heikenwälder M, Tacke F. Immune mechanisms linking metabolic injury to inflammation and fibrosis in fatty liver disease—novel insights into cellular communication circuits. *J Hepatol.* 2022;77(4):1136-60. DOI: [10.1016/j.jhep.2022.06.012](https://doi.org/10.1016/j.jhep.2022.06.012)
  26. Rossi JF, Lu ZY, Massart C, Levon K. Dynamic immune/inflammation precision medicine: The good and the bad inflammation in infection and cancer. *Front Immunol.* 2021;12:595722. DOI: [10.3389/fimmu.2021.595722](https://doi.org/10.3389/fimmu.2021.595722)
  27. Michalopoulos GK, Bhushan B. Liver regeneration: biological and pathological mechanisms and implications. *Nat Rev Gastroenterol Hepatol.* 2021;18(1):40-55. DOI: [10.1038/s41575-020-0342-4](https://doi.org/10.1038/s41575-020-0342-4)
  28. Burtscher J, Pasha Q, Chanana N, Millet GP, Burtscher M, Strasser B. Immune consequences of exercise in hypoxia: A narrative review. *J Sport Health Sci.* 2024;13(3):297-310. DOI: [10.1016/j.jshs.2023.09.007](https://doi.org/10.1016/j.jshs.2023.09.007)
  29. McQuitty CE, Williams R, Chokshi S, Urbani L. Immunomodulatory role of the extracellular matrix within the liver disease microenvironment. *Front Immunol.* 2020;11:574-276. DOI: [10.3389/fimmu.2020.574276](https://doi.org/10.3389/fimmu.2020.574276)
  30. Chen K, Rao Z, Dong S, Chen Y, Wang X, Luo Y, Gong F, Li X. Roles of the fibroblast growth factor signal transduction system in tissue injury repair. *Burns Trauma.* 2022;10:005. DOI: [10.1093/burnst/tkac005](https://doi.org/10.1093/burnst/tkac005)
  31. Campana L, Esser H, Huch M, Forbes S. Liver regeneration and inflammation: From fundamental science to clinical applications. *Nat Rev Mol Cell Biol.* 2021;22(9):608-24. DOI: [10.1038/s41580-021-00373-7](https://doi.org/10.1038/s41580-021-00373-7)
  32. Wu R, Xie Y, Peng Y, Wu X, Ma Y, Lyu FJ, Zheng Q, Deng Z. Young human plasma-derived extracellular vesicles rescue and reactivate IL-1 $\beta$  and TNF- $\alpha$  treated chondrocytes. *Exp Cell Res.* 2024;437(2):114009. DOI: [10.1016/j.yexcr.2024.114009](https://doi.org/10.1016/j.yexcr.2024.114009)
  33. Mega A, Marzi L, Kob M, Piccin A, Floreani A. Food and nutrition in the pathogenesis of liver damage. *Nutrients.* 2021;13(4):1326. DOI: [10.3390/nu13041326](https://doi.org/10.3390/nu13041326)
  34. Leddin D. The impact of climate change, pollution, and biodiversity loss on digestive health and disease. *Gastro Hep Adv.* 2024;2. DOI: [10.1016/j.gastha.2024.01.018](https://doi.org/10.1016/j.gastha.2024.01.018)
  35. D'Accolti M, Soffritti I, Bini F, Mazziga E, Mazzacane S, Caselli E. Pathogen control in the built environment: A probiotic-based system as a remedy for spreading antibiotic resistance. *Microorganisms.* 2022;10(2):225. DOI: [10.3390/microorganisms10020225](https://doi.org/10.3390/microorganisms10020225)
  36. Al-Kennany ER, Al-Hamdany EK. Pathological effects of anabolic steroid (Sustanon<sup>®</sup>) on the liver of male rats. *Iraqi J Vet Sci.* 2014;28(1):31-9. DOI: [10.33899/ijvs.2014.89469](https://doi.org/10.33899/ijvs.2014.89469)
  37. Jasim JY, Al-Tae SK. Evaluation of the role of green synthesis silver nanoparticles as adsorbents and protective agents for broilers tissue treated with aflatoxin. *Iraqi J Vet Sci.* 2023;37(3):675-81. DOI: [10.33899/ijvs.2023.136771.2614](https://doi.org/10.33899/ijvs.2023.136771.2614)
  38. Al-Ali SA, AL-Tae SK, Al-Sabaawy HB. Effect of antibiotic substitution with *Saccharomyces cerevisiae* and probiotic on broilers' hematic parameters and growth performance. *Iraqi J Vet Sci.* 2023;37(3):667-73. DOI: [10.33899/ijvs.2023.137187.2648](https://doi.org/10.33899/ijvs.2023.137187.2648)

تشرين الثاني ٢٠٢٢ إلى تشرين الثاني ٢٠٢٣ بهدف الكشف عن أي تغييرات مرضية وظهور حالات عدوى في العينات التي تم جمعت لغرض تحليلها كشفت الملاحظات النسيجية عن وجود آفات مرضية تمثلت بالالتهاب والنخر في الخلايا الكبدية مع احتقان الأوعية الدموية، كما لوحظ احتقان في الوريد وارتشاح خلايا كوفر. أظهرت الاختبارات المناعية الكيميائية تواجد عامل النخر الورمي في المناطق الملتهبة والمناطق المصابة، مما يشير إلى وجود رد فعل التهابي قوي. بينما تم الكشف عن عامل نمو الأرومة الليفية بمستويات عالية في المناطق التي تظهر فيها علامات التجدد ونمو النسيج الليفى، مما يبرز دوره الحيوي في عملية الشفاء وترميم الأنسجة. بلغ معدل الإصابة بين البط ٥٢%، مما يسلط الضوء على انتشار آفات الكبد بين هذا المجتمع من البط. يقدم هذا البحث معلومات مهمة حول أمراض الكبد في البط في الموصل ويساهم في تحسين فهمنا لأسباب وأعراض الأمراض التي تؤثر عليها. نتائج الدراسة المتعلقة بتعبير عامل نخر الورم الفاو عامل نمو الأرومة الليفية وتمنحنا فهماً أعمق للعمليات التي تكمن وراء تطور المرض، وقد تمهد الطريق لاستراتيجيات أفضل للعلاج والوقاية.

## التعبير المناعي الكيميائي النسجي لعامل النخر الورمي- الفا وعامل نمو الأرومة الليفية والتقييم المرضي لآفات كبد البط في مدينة الموصل

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الموصل، الموصل، العراق

### الخلاصة

يركز هذا البحث على دراسة أمراض الكبد في البط في مدينة الموصل، من خلال التحليل وفحص تعبير بروتينات كل من عامل النخر الورمي وعامل نمو الأرومة الليفية كمؤشرات على الالتهاب والنمو غير الطبيعي في أنسجة الكبد. وقد تم جمع عينات من كبد البط في الفترة من