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Histopathological Evaluation of Liver Tissue in the Common Carp (*Cyprinus carpio*) Following Vaccination Against *Aeromonas hydrophila*

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ABSTRACT

This study aimed to evaluate the effect of vaccination against *Aeromonas hydrophila* in common carp (*Cyprinus carpio*). The research was conducted between October 2024 and February 2025 at the Marine Science Center, University of Basrah, Iraq. Histopathological examinations of liver tissues were carried out to monitor pathological alterations and to assess the vaccine's effectiveness in reducing these changes. The histopathological results revealed notable differences among the experimental groups. In Group 1 (G1), the hepatic architecture appeared normal. In contrast, Group 2 (G2) exhibited significant vascular congestion, although hepatocytes remained relatively intact. Group 3 (G3) showed clear signs of hepatocellular necrosis. However, groups 4 (G4) and 5 (G5) displayed reduced severity of edema and necrosis. This suggests that vaccination—whether administered before infection or as repeated doses—provided partial protection. It alleviated the severity of infection by enhancing the immune response in the liver without causing substantial tissue damage. In conclusion, the vaccine against *Aeromonas hydrophila* demonstrated a clear protective effect on liver tissue. Its effectiveness was influenced by the number of doses administered and the fish's exposure to the bacteria.

INTRODUCTION

Aeromonas hydrophila is a facultative anaerobic, Gram-negative, rod-shaped bacterium common found in freshwater environment. It is recognized as a major pathogenically in aquaculture, causing significant morbidity and mortality among various fish species **(Semwal *et al.*, 2023)**. This bacterium has a significant impact on the welfare and productivity of various fish species, especially carp (*Cyprinus carpio L.*), and is therefore considered one of the main causes of disease in fish farms **(Pereira, 2023; Jumma, 2024)**. The pathogenic nature of this bacterium is rooted in its capability to infiltrate host tissues and to dodge immune defenses, leading to a range of clinical symptoms and serious systemic infections **(Hiba *et al.*, 2020; Ahangarzadeh *et al.*, 2022)**.