

A study on the effect of chitosan gel on the treatment of ornamental fish
(*Carassius auratus*) externally infected with *Aeromonas hydrophila* bacteria

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Abstract

Chitosan is a polysaccharide extracted from chitin, which is taken from shrimp, crab and insects that act as a gel after diluting it with dilute acetic acid (1), and the concentration was chosen 2% because it is the most suitable after trying it on the fish, and the slices on the gills of the fish were wiped with it for a week and two weeks and gave clear healing results. Significantly and cheaply, this is due to the efficiency of 20% in healing muscle tissue, skin and also, and researchers must pay attention to the use of recycled natural materials because of the lack of side effects and the low cost and ease of obtaining them.

Keywords: *Aeromonas hydrophila*, *Carassius auratus*, Chitosan Gel

Introduction

Goldfish (*Carassius auratus*) is sensitive to bacterial infections, which may result in the external ulcer, erosion of the fin, and systemic disease [1]. These pathogens include the *A. hydrophila* that are hard to manage and subsequently lead to a high mortality rate in ornamental aquaculture [2]. Conventional antibiotics pose the threat of antimicrobial resistance, tissue residues, and the environment [3]. Thus, the aquaculture sector is actively finding natural, biodegradable, and safe alternatives [4]. The deacetylated form of chitin is chitosan, one of the most promising biomaterials because of its antimicrobial and biocompatible properties [5]. Chitosan, when shaped into a hydrogel, is a semi-permeable network that can attach itself to the tissues and provide an ideal environment in which the wound can heal [6]. Besides the physical security measures, chitosan hydrogel is a substance that allows the controlled release of active

molecules, enhancing the outcome of the therapeutic procedure [5]. Such a dual-stage creates "chitosan-hydrogel" especially effective at treating surface bacterial infections in fish [6]. Recent findings affirmed a positive antibacterial property of the chitosan and its nanoparticle against most common fish pathogens such as *A. hydrophila* and *Vibrio* species [7]. Chitosan also disrupts bacterial adhesion and biofilm formation and increases its therapeutic potential [8]. In addition to antimicrobial effect, chitosan increases immunity, antioxidant capacity, and regeneration of tissues in fish [7]. Wound dressing made of chitosan is faster in healing wounds because it promotes collagen formation, angiogenesis, and epithelial regeneration [9]. In addition, high technology or advanced chitosan the gel formulations like the magnetic chitosan hydrogels or composite gels demonstrate good mechanical stability and superior

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