

# Histomorphological Study and biochemical changes in kidney of gray mullet (*Mugil cephalus*) exposed to iron oxide nanoparticles and *Spirulina platensis*

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## Abstract

Increasing uses of nanoparticles such as iron oxide and its many fields of applications, on the other hand, lead to their discharge into an aqueous environment and may interfere with physiological processes for aquatic organisms. On the other hand, *Spirulina* with antioxidant and therapeutic properties is used as a dietary supplement in aquaculture. The aim of the present study was to evaluate histomorphological effects of kidney and serum levels of urea, creatinine, uric acid of oral administration of iron oxide nanoparticles and the therapeutic effects of *spirulina platensis* in *Mugil cephalus*. After two weeks of adaptation, 72 fish gray mullet (*Mugil cephalus*) weighting (22.79± 1.14 g) and with length (12.322±0.194 cm) were divided into 11 groups in 40-liter aquariums. Treatments included 3-day (short-term) and 60-day (long-term) groups receiving 15 mg/kg iron oxide nanoparticles, 300 mg/kg *spirulina platensis*, and a combination of both. Histological and histomorphometric changes were performed, including the diameter of the lumen of distal and proximal tubules, the height of epithelium of distal and proximal tubules, the diameter of the renal corpuscle, the diameter of the glomeruli, and the size of the urinary space (Bowman capsule). Serum levels of urea, uric acid, and creatinine were then measured. Statistical analyses were performed using SPSS version 26, One Way ANOVA and Tukey post test. The results indicated that iron oxide nanoparticles for 60 days led to significant changes in all factors (except for diameter of the renal corpuscle) compared with the control group. In contrast, *Spirulina platensis* caused a significant decrease in diameter of the lumen and an increase in height of epithelium of distal and proximal tubules, which was a significant increase in the distal tubules. *Spirulina platensis* decreased no significant diameter of urinary space. The results showed that spirulina acts against effects induced by iron oxide nanoparticles; in other words, it could neutralize the damage caused by the nanoparticles. It was observed that iron oxide nanoparticles cause a slight decrease in serum urea level, but spirulina increases the amount of serum urea, which was not significant. Spirulina prevented a large increase in serum creatinine and a large decrease in uric acid caused by nanoparticles and therefore had a compensatory function.

**Key words:** *Spirulina platensis*, Nanoparticles, Iron oxide, Gray mullet, Histology

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