

# Microcystin-LR influences interactions between intestinal microbiota and environmental factors and inducing ferroptosis in intestine of common carp (*Cyprinus carpio*)

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## Background

- The environmental impact of microcystin-LR (MC-LR) is severe and jeopardizes aquatic biosafety and public health due to pollution of oceans, rivers, lakes, ponds and drinking water.
- The presence of MC-LR can influence the composition of fecal bacteria communities and increase the risk of pathogen invasion, while interfering with recovery. However, the specific mechanisms underlying the toxicity of MC-LR and interactions between the host and intestinal microbiome remain unclear.
- The present study adopted “-omic” approaches to identify biomarkers of the host intestinal microbiome by exploiting the ferroptosis mechanisms of intestinal tissue and to dissect the relationship between water quality and the microbiome to assess environmental quality. Consequently, the main purpose of the present study was to provide novel insights into the mechanisms underlying MC-LR-induced enterotoxicity in the common carp and the potential impact of the aquatic environment on organisms.

## Materials and methods

- Forty three common carp were exposed to 10 µg/L of MC-LR treatment group for 14 days.
- Assessment of water quality
- Histomorphological examination of intestines
- Iron and lipid peroxidation assays
- Intestinal microbiota and Metabolomics analysis

## Conclusions

- MC-LR exposure induced oxidative stress and pathological lesions in the intestine of the common carp by ferroptosis.
- Verrucomicrobia* and *Bdellovibrionota* are suitable as biomarkers of water quality and key to intestinal ferroptosis, and thus should be taken into account in aquaculture and even natural environments in response to MC-LR.
- The results of the present study revealed a novel toxic mechanism of MC-LR in the intestine of the common carp, provide support for monitoring of water quality, laid a foundation to maintain the health of aquaculture systems, and provide references for biosecurity and assessment of potential threats to human health.

## Results

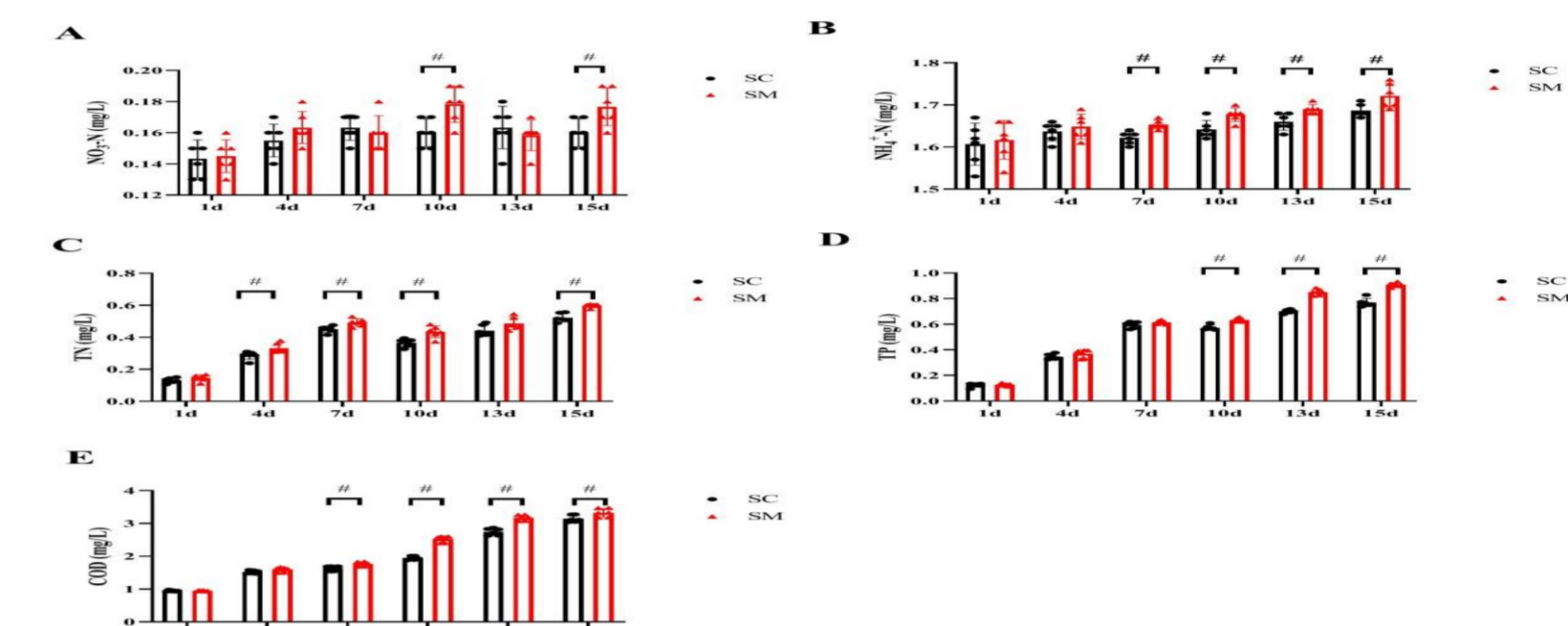


Fig. 1 Changes in water quality parameters in the control and MC-LR groups.

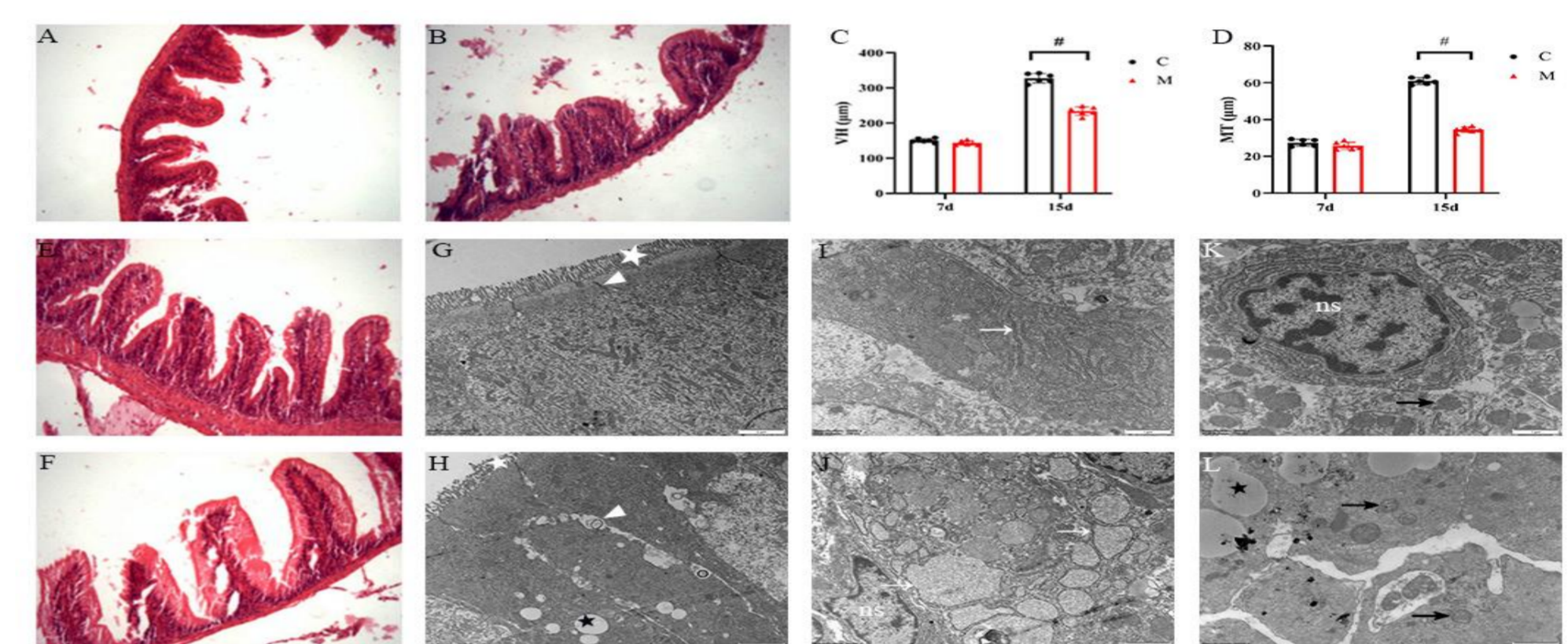


Fig. 2 Histopathological and ultrastructural observations of the mid intestine of common carp exposed to MC-LR.

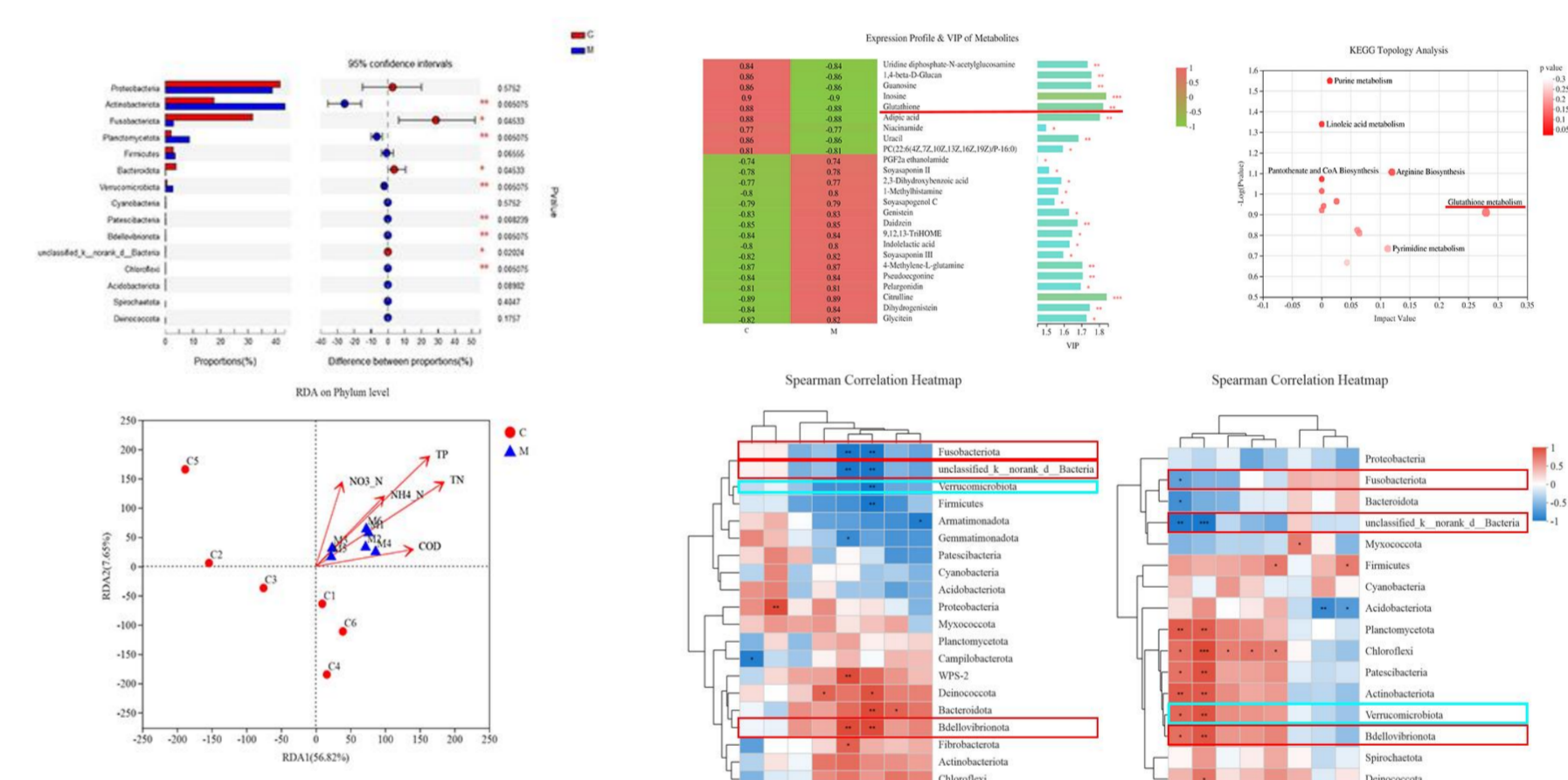


Fig.3 Interactions between water environmental factors and the intestinal microbiome in response to MC-LR treatment

