Multi-omics reveals response mechanism of liver metabolism of hybrid sturgeon under ship noise stress

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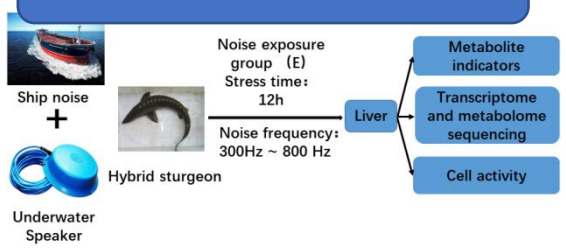
Abstract

Underwater noise from ship engines can affect the metabolism and immune system of various fish species. Meanwhile, changes in the metabolic pathways in liver are important for fish to adapt to adverse environments. We used a combined multi-omics analysis to investigate the response mechanism of hybrid sturgeon to continuously played ship noise. A control group and a noise group (simulated ship noise: 12 h) were set up, and liver tissues were extracted for high-throughput transcriptome and metabolome sequencing. The results show that a total of 588 differentially expressed genes (DEGs) and 58 DEGs metabolites were detected. The joint

Introduction

Anthropogenic noises caused by human activities have become the main source of underwater noise . Noise pollution affected growth performance, physiology and behavior of various fish species. For example, vessel noise in the wild causes higher oxidative stress and poor growth in juvenile fish. Adults exhibited alertness or

Materials and method



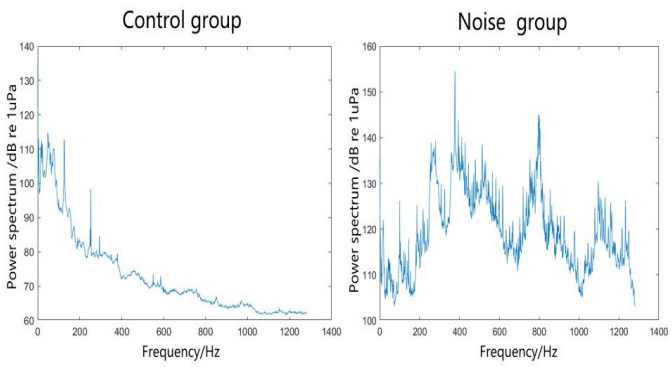
1.Experimental Conditions and Animals

- Exposure 12h
- Ship noise 300Hz ~ 800Hz
- experimental pool (diameter d=1m, water depth 0.5m)

2.Experimental Design and Sampling

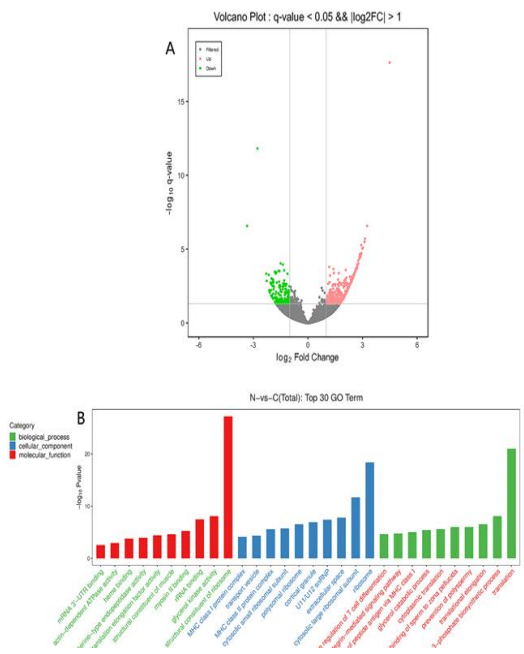
Result

Noise spectrum

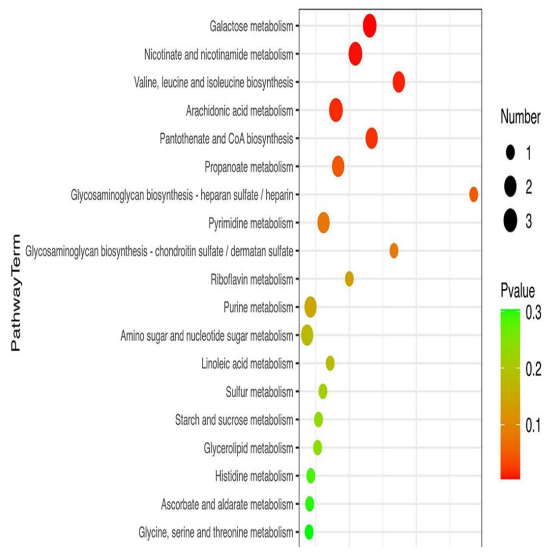


Underwater sound spectra of control and noise groups.

Terminology of DEGs and related gene ontologies (GO)



Vesicle diagram with the names of metabolic pathways in vertical coordinates



Conclusion

During continuous exposure to underwater noise, for hybrid sturgeons, apoptosis and cell motility were increased, protein synthesis was inhibited. Lipid metabolism, nucleotide metabolism, and vitamin D3 metabolic pathways were inhibited as well. Meanwhile, normal immunity of the sturgeon was ensured through the initiation of

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2. Bolger AM, Lohse M, Usadel B. Trimmomatic: a flexible trimmer for Illumina sequence data. Bioinformatics 2014; 30: 2114-2120.

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