Study reveals network of energy reallocation in Litopenaeus vannamei responsive to heat-stress

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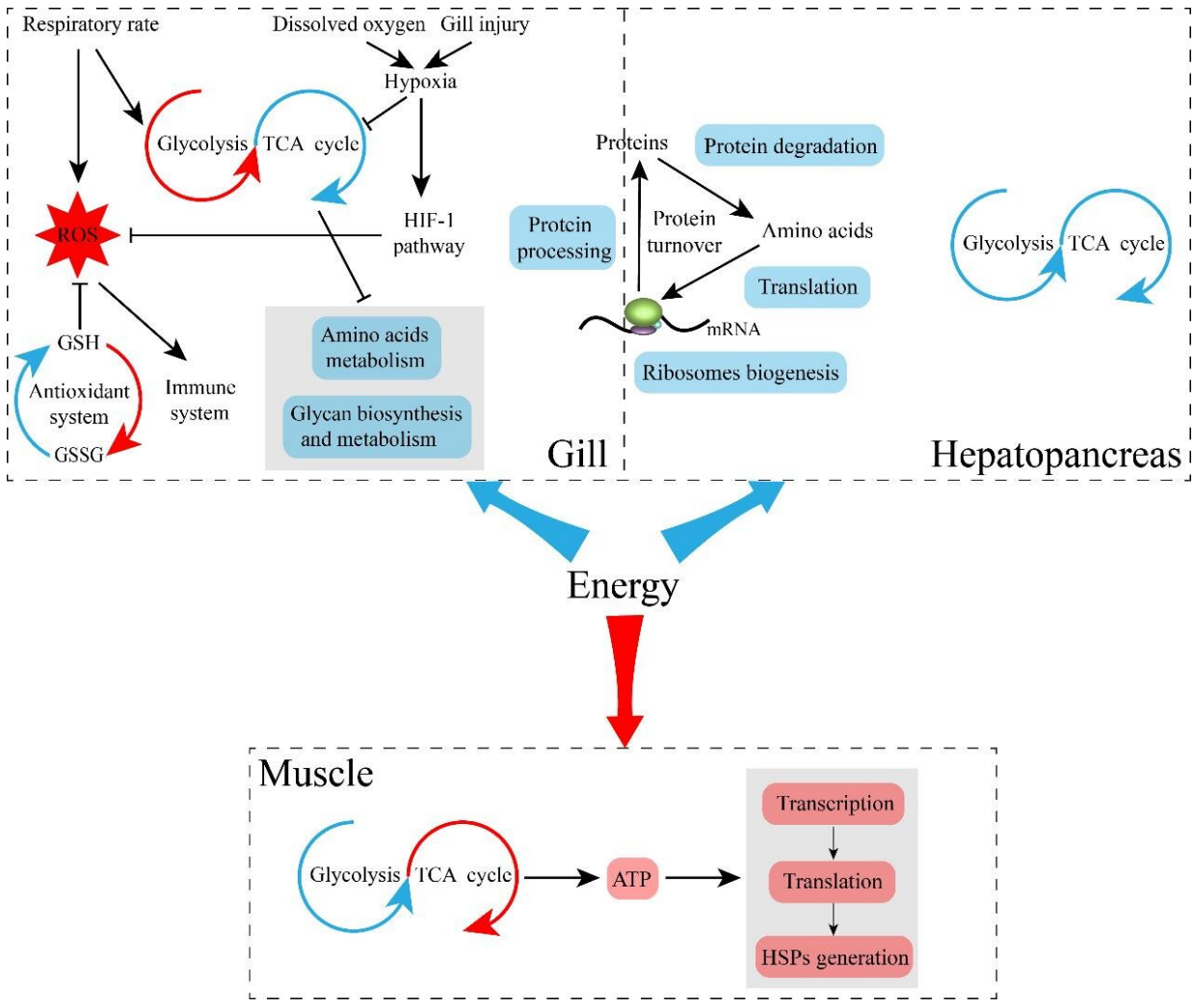

Schematic illustration of separate responses and energy reallocations among three tissues under heat stress. The red and blue rectangles or arrowheads

represent up-regulated and down-regulated biological processes. Credit: IOCAS

High economic value and excellent characteristics for breeding have enabled the Pacific white shrimp Litopenaeus vannamei to become one of the major aquaculture species in the world. However, in summer, continuous hot weather or periodic temperatures above 35 degrees Celsius leads to high mortality rates of the shrimp. Therefore, it is necessary to investigate the mechanisms of L. vannamei in response to high temperature.

Recently, a research team led by Prof. Li Fuhua from the Institute of Oceanology of the Chinese Academy of Sciences (IOCAS) provided new insights into the energy reallocation strategy in L. vannamei in response to heat-stress.

The study was published in *Ecotoxicology and Environmental Safety* on May. 5.

Previous studies about heat stress were limited to single tissues or only a few indicators. However, the spatial network of tissue cooperation and the relationship with energy in response to heat stress remain unclear.

In this study, the researchers conducted a comparative and sound transcriptomic analysis on three tissues of shrimp under heat stress, including hepatopancreas, gills and muscle. They found that energy-related genes were the main change genes, which inferred that energy flux might be reallocated among different tissues under heat stress.

"Understanding the cooperation of various tissues of animals in response to heat stress is the basis for clarifying the regulation mechanism of different species under heat stress," said Dr. Zhang Xiaoxi, first author

of the study.

"We find that different tissues may cooperate with each other simultaneously via energy reallocation in response to heat stress. Less energy was channeled into protein turnover in gill and hepatopancreas for minimally life sustaining, and more energy was required for muscle to get out of adverse circumstances," said Prof. Zhang.

"This work not only provides a comprehensive understanding of the molecular mechanism of L. vannamei in response to high temperature, but also lays the foundation of mining thermotolerance genes and proposing effective strategies to cope with the high-temperature environment," said Prof. Li.

More information: Xiaoxi Zhang et al, Comparative transcriptomic analysis unveils a network of energy reallocation in Litopenaeus vannamei responsive to heat-stress, *Ecotoxicology and Environmental Safety* (2022). DOI: 10.1016/j.ecoenv.2022.113600

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