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Identification and differential expression profiling of microRNAs from white and red muscles of *Siniperca chuatsi*

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MicroRNAs (miRNAs) participate in the regulation of myogenesis and muscle physiological function. Most skeletal muscles in vertebrates contain a mixture of fibertypes. So far, the regulation mechanism of the miRNA in terms of controlling muscle phenotype is poorly understood. In the present study, we use *Siniperca chuatsi* as a model system and demonstrate that miRNAs are involved in regulating the physiological processes and metabolism of different muscle fibers in vertebrates. The miRNA transcriptomes of the white muscle, red muscle, and 5 other tissues from *Siniperca chuatsi* were profiled using Solexa deep sequencing. We characterized 186 conserved miRNAs and 3 novel miRNAs from the two small RNA libraries from white and red muscles. Among the 155 miRNAs overlapped between the two libraries, we identified 60 significantly expressed miRNAs between the two muscle fibers. Using integrative miRNA target-prediction and network-analysis approaches, an interaction network of differentially expressed and muscle-related miRNAs and their putative targets were constructed. Several miRNAs that could act to control the gene expression and performance of the different muscle fiber types by targeting the myostatin gene were identified. These miRNAS could be involved in inhibitition of myoblast differentiation and myotube size.

We also use *Siniperca chuatsi* as a model system and analyze the potential function of microRNAs in regulating MyoD expression. We demonstrated that miR-143 expression was negatively correlated with MyoD expression in the fast and slow muscles of *S. chuatsi*. The luciferase reporter assay further verified the direct inhibitory effect of miR-143 on MyoD expression. Blocking the miR-143 function resulted in significant increase in MyoD and fast myosin heavy chain gene expression fish muscles in vivo. Taken together, our studies indicate that miRNA is involved in the regulation of MyoD expression and consequently the in controlling the performance of the different muscle fiber types in vertebrates.

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