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Cellular Degradation Activity is Activated by Ambient Temperature Reduction in an Annual Fish (Nothobranchius rachovii)

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Abstract : Ambient temperature reduction (ATR) can extend the lifespan of an annual fish (Nothobranchius rachovii), but the underlying mechanism is unknown. In this study, the expression, concentration, and activity of cellular-degraded molecules were evaluated in the muscle of N. rachovii reared under high (30 °C), moderate (25 °C), and low (20 °C) ambient temperatures by biochemical techniques. The results showed that (i) the activity of the 20S proteasome, the expression of microtubule-associated protein 1 light chain 3-II (LC3-II), the expression of lysosome-associated membrane protein type 2a (Lamp 2a), and lysosome activity increased with ATR; (ii) the expression of the 70 kD heat shock cognate protein (Hsc 70) decreased with ATR; (iii) the expression of the 20S proteasome, the expression of lysosome-associated membrane protein type 1 (Lamp 1), the expression of molecular target of rapamycin (mTOR), the expression of phosphorylated mTOR (p-mTOR), and the p-mTOR/mTOR ratio did not change with ATR. These findings indicated that ATR activated the activity of proteasome, macroautophagy, and chaperone-mediated autophagy. Taken together these data reveal that ATR likely activates cellular degradation activity to extend the lifespan of N. rachovii.

Keywords : ambient temperature reduction, autophagy, degradation activity, lifespan, proteasome
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