Is gill cortisol concentration a good acute stress indicator in fish? A study in rainbow trout and zebrafish - DTU Orbit (17/10/2019)

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Cortisol is the main biomarker of physiological stress in fish. It is usually measured in plasma, which requires blood collection. Though cortisol is produced in the anterior kidney, it can diffuse easily through cell membranes due to its lipophilic nature. Taking advantage of that, some non-invasive techniques have been developed to measure cortisol directly in the water from fish-holding tanks, in skin mucus or in scales. In this study, we explored the possibility to analyze fish cortisol from gill filaments as a reliable acute stress marker. Our results show that gill cortisol levels correlate well with plasma cortisol levels in both rainbow trout and zebrafish exposed or not to an acute stress protocol. Measuring cortisol in gill filaments increases the available possibilities for stress assessment in fish. Although this approach should yet be tested for its use with other stressors, it has several advantages: In relatively large fish (i.e. above 30 g) gill cortisol levels could be measured in vivo. Sampling of gill biopsies is very fast and easy, and the procedure does not induce stress if properly performed, making it an ideal option for in vivo stress assessment. In small fish, the use of gill tissue to measure cortisol has important technical advantages with respect to the current methods using whole-body homogenates. Gill homogenates could be used directly for ELISA cortisol analysis, avoiding the need of tedious and expensive cortisol extraction protocols, and, since no organic solvent is required, contributing for a more environmentally friendly analysis.

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