Primary culture of rainbow trout myoblasts as a tool to study the nutritional control of the autophagy-lysosomal pathway

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Abstract: Endocrine disrupting compounds (EDCs) are found worldwide in aquatic ecosystems and can lead to developmental and reproductive disruption in fishes; however, little is known about the population level consequences of exposure to EDCs. Understanding population level responses to EDC exposure is critical to the conservation and management of a wide variety of fishes. We evaluated the effects of 17alpha-ethinylestradiol (EE2), the synthetic estrogen in human birth control, on fathead minnow (Pimephales promelas) population dynamics in aquatic mesocosms. We introduced 5 male and 5 female fish to each of 28 1100L mesocosms and exposed fish to 4 treatment concentrations of EE2 (0, 5, 10, and 20ng/L) for 126 days. Each treatment had 7 replicates arranged in a randomized block design. Adult survivorship, egg production, numbers and size of offspring and biomarkers of estrogen exposure were collected during the experiment and used to parameterize stage-structured population models. Our experimental and modeling results indicated that fish populations can be negatively impacted by environmentally relevant EE2 concentrations.

PRIMARY CULTURE OF RAINBOW TROUT MYOBLASTS AS A TOOL TO STUDY THE NUTRITIONAL CONTROL OF THE AUTOPHAGY-LYSOSOMAL PATHWAY

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Abstract: Autophagy is an intracellular bulk degradation process controlled by nutrient and involved in macromolecular turnover. In mammals, the regulatory networks that control this degradative route have been intensively investigated in recent years. In contrast, in fish the autophagic pathway has been the subject of little attention.

The present work aimed to use rainbow trout myoblasts to characterize the response of the autophagy-lysosomal pathway to nutrient and serum availability. We report that serum and amino acids (AA) withdrawal is accompanied by a rapid increase of autophagosome formation but also by a slower induction of the expression of several autophagy-related genes. We also show that this later response is controlled by AA availability via both TOR-dependent and TOR-independent pathways.

Together these results demonstrate the existence of both short- and long-term control of the autophagy-lysosomal system in rainbow trout and identify AA as new players in the regulation of expression of autophagy-related genes.

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