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Environmental stimuli and their impact on cellular homeostasis and gene regulation

Other Subjects

POSTER PRESENTATIONS

1.
Effects of arginine and/or lysine diet supplementation on nitrogen excretion in zebrafish

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One of the more notable amino acid interactions is between lysine and arginine. The effects of feeding disproportionate levels of lysine and arginine have been studied in few fish species, while lysine–arginine antagonism has been demonstrated only in Salmonids (rainbow trout and Atlantic salmon).

Here we report preliminary results on the effects of arginine and/or lysine supplementation on nitrogen excretion (i.e. ammonia and urea excretion) in the Ciprinid *Danio rerio* fed with a low-protein (33.5%) diet. Arginase activity in animals fed with control diet was also determined and found to occur in both liver and muscle tissue.

After two weeks of arginine supplemented diet (35 g/kg), total nitrogen excretion (ammonia-N plus urea-N) was significantly stimulated. The effect was stronger on urea excretion. Vice versa, dietary lysine supplementation (35 g/kg) slightly reduced both ammonia and urea excretion, suggesting a sparing or inhibitory effect on protein catabolism. Fish fed with a diet enriched with both amino acid displayed a significantly lower ammonia and urea excretion compared with those fed with the arginine enriched diet. The effect was stronger on ammonia excretion. These results suggest that increasing the levels of dietary lysine may reduce the utilization of arginine, because of a possible interaction between the two amino acids, and indicates that lysine–arginine antagonism may also occur in zebrafish, although higher lysine doses are probably necessary to effectively block arginine intestinal absorption and/or inhibit arginase activity.

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2.
DARENET: A novel technological platform to promote the use of zebrafish model

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Initially, the zebrafish (*Danio rerio*) model was used as a model in developmental biology. However, in more recent years this model organism has come to the attention of the international scientific community in many other applicable areas in both basic and applied research. Even though the areas of application and the scientific objectives of the different research centres and companies are quite varied, they all use the same model for research and development. Common procedures and methodologies should therefore be standardised, making it essential to introduce standard operating procedures (SOPs) in order to consolidate this model organism as an alternative method to other vertebrate model organisms such as mice, which have a higher cost in economic and ethical terms. In this regard, the European Union is promoting the use of alternative vertebrate model organisms in all applicable areas. This is why one of the objectives of this Spanish Technological Platform is to promote the implementation of SOPs that ensure animal welfare for this model according to the

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"3Rs": Reduction, Refinement and Replacement. These include the development of protocols to evaluate the animal's welfare and to control its health, to establish microbiological and genetic standards for the animal and standardise anaesthesia, analgesia endpoint criteria etc. Likewise, another important objective of this platform is to increase research that uses this model organism in all priority areas such as health, biotechnology and environment, and eventually, to promote the presence of this platform in private and public research centres, and especially in large and small companies. Funded by the Spanish Ministry of Science and Innovation.

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3.
Expression profiling of antioxidant enzymes in the gill of disk abalone after viral hemorrhagic septicemia virus (VHSV) infection

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Antioxidant enzymes are involved in reduction of the oxidative stress in marine organisms. Hence, transcriptional response of antioxidant enzymes could be used as a molecular indicator of pathogenic status of virus and other microbial infections. In our previous study, we have identified and characterized the different antioxidant enzymes namely Mn-superoxide dismutase (Mn-SOD), CuZn-superoxide dismutase (CuZn-SOD), catalase, thioredoxin peroxidase (TPx), mitochondrial thioredoxin-2 (Mt-TRx-2) and Selenium dependant glutathione peroxidases (SeGPx) from disk abalone (*Haliotis discus discus*). The present study aims to analysis the transcriptional responses of antioxidant enzymes in the gill of disk abalone after viral haemorrhagic septicaemia virus (VHSV) infection.

For the challenge experiment, abalones were infected by intramuscular injection of 50 μL VHSV (1×10^8 pfu/ml per abalone). Same amount of phosphate buffered saline (PBS) was injected as a control experiment. Gill tissue was isolated from VHSV and PBS (control) injected animals. Relative mRNA expression was analyzed by quantitative real-time PCR.

Results showed that antioxidant responses were varies with the highest expression time point and expression pattern after VHSV injection in gill. The highest expression was detected in SeGPx (6.6-fold) at 24 h p.i of VHSV compared to PBS group. MnSOD mRNA was gradually increased and reached to its maximum at 12 h with 2-fold induction and then decreased to the basal level. In contrast, all other antioxidant genes were not induced over 2-fold during the 48 h of p.i. Our results showed that VHSV infection could induce the abalone antioxidant enzymes, thereby suggesting that abalone could activate the innate immune defense response against viral infection.

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