Zebrafish facility

Our Zebrafish Facility

The peculiarity of our Zebrafish Facility is that it is devoted to studies of interest for the Aquaculture sector (freshwater and marine). Since ZF foundation, we have been carrying out studies related to:

- ✓ Fishmeal replacement in aquafeed – studies have been carried out using alternative feed ingredient such as insect meal and autolysed yeast.
- ✓ Nutraceutic effects of feed ingredients – several studies on the immune-modulatory effect of 1,3-1,6 ß-glucan have been carried out, measuring the tissues regeneration and the wound healing performances
- ✓ Essential oils and fish egg disinfection - several essential oil and essential oil extracts have been tested on zebrafish embryos for its antimicotic activity against saprolegna (*Saprolegnia parasitica*)

The facility consists of two stand-alone, 32 tanks each, 3.5 L capacity, in a recirculating system. Within this facility, a variety of different experimental designs can be set up. Hereafter some examples:

- ❖ 4 treatments (groups) x 4 replicates, 20 fish per replicates (16 tanks totally out of 64)
- ❖ 3 treatments (groups) x 5 replicates, 20 fish per replicates (15 tanks totally out of 64)
- ❖ 8 treatments (groups) x 3 replicates, 20 fish per replicates (24 tanks totally, out of 64)

When performing growth performances trials, we are able to obtain individual measurements (e.g., body weight gain) without pit-tagging a single fish. In fact, through the unique livrea's pattern and taking a digital image, each fish can be individually recognized increasing the number of observation (n) and the accuracy of the experiment (see picture 1).

Moreover, all the possible experimental designs can be organized using embryos (up to 5 dpf), maintained in controlled conditions (incubator) and reared in Petri dishes.

Normally, WT Zebrafish AB line is used but it is also possible to use mutant or transgenic lines according to the need of the research projects. Also, within our Department it is possible performing chemical, histological, PCR analysis and behavioural studies.

Our routinely procedures include the following minimum controls:

- ❖ daily - dissolved oxygen levels, pH, temperature and conductivity;
- ❖ weekly – Ammonium, nitrite and nitrate.

Definitely, several other measurements and analysis can be performed according to the specific need of the research project.

The facility is authorized as both breeding center and research center.

Why Zebrafish as animal model for aquaculture research?

This popular fish has become an important vertebrate model organism in scientific research. The zebrafish owes much of this success to its hardiness, cold resistance, easiness to breed and variable omnivorous diet. Key benefits for the laboratory include the fact that they are photoperiodic breeders, have regenerative abilities and their transparent embryos can be harvested easily and manipulated from birth. Egg and tissues transparency during early life stages is perhaps the most crucial of all these qualities, as this allows microscopic visualisation of cellular processes including blood-flow and wound healing.

As oviparous breeders, successful embryo production depends heavily on the presence of eggs in females. Factors that impact upon breeding success including diet, rearing density and stress, water quality, age, genetics (in-breeding), among others. Breeding occurs daily each female produces vast

numbers of embryos (100-500 or more). After releasing, the speed of embryo development can be easily manipulated. In fact, the zebrafish originally attracted the attention of biologists due to its potential as a developmental model for the principles of cellular and molecular biology. Genetic engineering was employed from the offset and developed to create alterations in normal biological pathways.

Genetically engineered strains, include visually detectable transgenic lines (Casper). Further validation of these fish as a model for human disease is the 70 per cent similarity between the human and zebrafish genome. This is the reason why zebrafish has potential as a non-mammalian model of disease (Parkinson's disease, motor neurone disease, wound healing, cancer, cardiovascular disease and arteriosclerosis, hypoxia, aging, epilepsy and muscular dystrophy) and, of course, for application on teleost research. Moreover, zebrafish are ideally suited for performing small molecule screens.
This genetically suitability of Zebrafish to human studies, obviously implies a closer genomic closeness to teleost. For this reasons, several authors have discussed and suggested the zebrafish suitability to research in Aquaculture (see main references).

Main references

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Contacts

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Authorizations:

- Facility authorized for breeding (Comune di Pisa, DD-16A/628 del 22/05/2017, n. 1431051)
- Facility authorized for research in accordance to the art. 12 of the DL 27/01/1992, n. 116.

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