OPTIMAL ENVIRONMENTAL CONDITION FOR ZEBRAFISH GROWTH

AIM

To study and understand about the optimal environmental conditions to grow zebrafish for experimental research.

INTRODUCTION

In current biological research, zebrafish model organism is used due to their rapid development, genetic tractability, and physiological similarities to higher vertebrates. To maintain zebrafish colonies in healthy manner requires controlled environment. The factors like temperature, lighting, water quality, size of the tank, and nutrient supply plays a major role to establish healthy zebrafish colonies for research studies. The overall physiological status, growth of zebrafish and reproduction can change due to alterations in these factors. The study assesses the impact of environmental enrichment on the behavior and stress levels of zebrafish as well as how well they adapt to varying water hardness levels. It offers valuable research guidelines. The comprehensive study not only describes the optimal growth conditions, but enhances the reliability of the research outcomes.

BASIC FEATURES OF ZEBRAFISH

Locality:

Tropical freshwater fish Native inhabitants of South Asian freshwater bodies (India, Pakistan, Bangladesh, Nepal, and Bhutan)

Characteristics:

Common name: Zebrafish, stripped Danio, zebra Danio.
Scientific name: Denio rerio
Family: Cyprinidae Order:
Cypriniformes Diet: omnivore
Breeding: Egg laying Size: up to 4cm
Life span: 2 to 3 years (under captivity: 5 years)

THEORY:

The key factors to be considered for growth are as follows:

1. Embryonic medium:

In general, the embryo, larvae or juvenile fish are developed in E3 medium, which is a basic solution that possess essential nutrients and salts for growth. E3 medium is named based on its three main components: NaCl, KCl, and CaCl2. The composition varies typically, depends on the experiment. E3 Medium Composition: 5 mM NaCl, 0.17 mM KCl, 0.33 mM CaCl2, and 0.33 mM MgSO4. The pH of the medium should be maintained around 7-7.2

2. Temperature:

The water should be maintained in the temperature range of 26-280C. It is necessary to maintain the temperature for normal growth and development.

3. Lighting:

The natural day-night cycle should be mimicked. Usually, 14 hours light cycle and 10 hours dark cycle is needed to maintain proper circadian ryhtms.

4. Water quality:

The water possess minimal ammonia and nitrite level or no ammonia/nitrite. The pH should be maintained at 6.8-7.2. Water should be cleaned regularly to remove wastes.

5. Aeration and Filtration:

A well aerated environment with good water circulation is needed. To remove the particulate matters and to maintain the water quality, filtration systems are used.

6. Tank size:

The social interactions and stress-free environment can be created by providing adequate tank space. Based on the number of fish, a spacious tank can be established.

7. Nutrition:

A high-quality balanced diet can be provided as feed (Eg: Sea weed or nutrient pellets). Supplements like brine shrimp, daphnia or blood worms can be given for healthy development.

8. Sterility:

Ensure the good hygiene in tanks. Practice good hygiene during handling of the fish, it aids in prevention of the infections.

9. Social structure:

In general zebrafish are social animals, that prefer to live groups. In order to promote natural behaviour, keep the fish in compatible groups.

10. Breeding conditions and Monitoring:

Breeding substrates (like mesh) should be provided in order to encourage breeding. Specific environmental cues, adjusting photoperiod, and other favourable conditions to promote spawning behaviour. Detailed record of breeding activities should be maintained properly and health monitoring is needed. Maintaining proper records and health observation, ensures the reliability in experimental outcomes.

CONCLUSION:

The specific requirements for zebrafish unit set up may varies according to the goals of the experiment. Notably, the basic parameters like water quality, aeration, temperature and pH maintenance, and photoperiod is required to develop healthy zebrafish colonies. A well-balanced environment is needed for effective research. In research, always follows the ethical guidelines to handle and to provide utmost care for the laboratory animal models.