

Zebrafish – An alternative animal model for evaluation of memory and learning parameters

Gaurav K. Bhargav¹, Dr. V. Chitra², Dr. Birend Wahengbam³, Tina Bania⁴

¹(Dept of Pharmacology, SRM College of Pharmacy, SRMIST, Kattankulathur, Chennai, email: grv27goku@gmail.com)

²(Dept of Pharmacology, SRM College of Pharmacy, SRMIST, Kattankulathur, Chennai, email: vp.pharmacy.ktr@gmail.com)

³(Dept of Biotechnology, Gauhati University, Guwahati, Assam email –birend25wang@gmail.com)

⁴(Dept of Pharmacology, SRM College of Pharmacy, SRMIST, Kattankulathur, Chennai, email: tina10bania@gmail.com)

Abstract:

The zebrafish acts as a useful alternative animal method for the evaluation of memory and learning strictures. The zebrafish model provides several aids from an economic point of view as compared to the mammalian models for research. Additionally, the rich arrays of developmental, behavioural, and molecular advances reachable by this zebrafish model have subsidized a snowballing mandate for the incorporation of the zebrafish model in behavioural pharmacological studies. Therefore, the zebrafish model has been used to illustrate the behavioural significances after exposure to several psychoactive agents, and also to comprehend the mechanical pathways for which this model has developed as an imperative means in drug discoveries studies.

Keywords — alternative, evaluation, memory, learning, developmental, behavioral, psychoactive

I. INTRODUCTION

The zebrafish teleost (*Danio rerio*) have extended the boundaries for behavioral pharmacology by permitting further economic and also complex throughput assays for the assessment of behavioral function as well as cognition. [1]

The zebrafish model delivers as a crucial intermediate testing model between the high throughput *invitro* screenings & the other mammalian models, as they permit the convenience of the *invitro* model and the intricate efficient proficiencies of the mammalian models.

The distinct chorion and the embryo through developmental stages of the zebrafish allow for the unremitting visualization of anatomical variations related to development, laterally with a rapid development time and the ability for composite behaviour foundation at a period of 3 days of post fertilization, which brands this model mainly beneficial for the measurement and changes occurring to the emerging neural networks.[1]

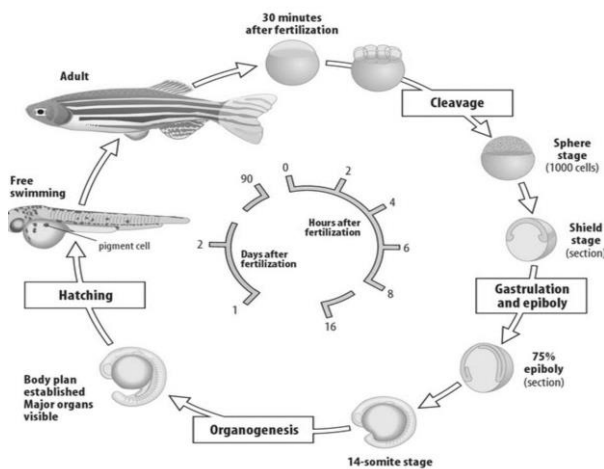


FIG- Life cycle of a zebrafish



FIG – The zebrafish model (Danio Rerio)

Additionally, the rich arrays of developmental, behavioral, and molecular advances reachable by this zebrafish model have subsidized a snowballing mandate for the incorporation of the zebrafish model in behavioral pharmacological studies. Crucial for this endeavor has been the progress of the trials to assess a range of behavior and also drug-associated effect in the zebrafish models.

The memory & learning function has enumerated nicely in this species, either thru the incorporation of measures with rodents analogs or the development of a novel specific assay for zebrafishes. Therefore, the zebrafish model has been used to illustrate the behavioral significances after exposure of several psychoactive agents, and also to comprehend the mechanical pathways for which this model has developed as an imperative

means in drug discoveries studies. Zebrafish has been showing to be a valuable asset in behavioral toxicological studies and also behavioral genetics and as well, being an exceptional models for the research involving neurobehavioral disorder.[1-3]

EVALUATORY PARAMETERS FOR ZEBRAFISH MEMORY AND LEARNING

A. Habituation process

Habituations signifies to state or condition in which a reflexive response becomes less probable or less dynamic subsequent to a repetitive stimulation and be understood inside the framework that the animal always tends to acclimatize to any stimulus that are not predominantly destructive, preserving its resources for a possibly hazardous stimuli instead. [3]

Though casually simple, the procedure of habituation is certainly a form of knowledge, and a rational dissimilarity seeing that the remembrance

of the prior inducements intermediates awareness to the later stimuli. An array of behavioural assessments for habituation and learning can be found in zebrafish related reviews, several modelled after those incorporated with rodent species. A tap provoked startle reflex have been incorporated in the adolescent or adult zebrafishes models to portray the different drug effect and touch or auditory caused reflexes in the larvae form or young fishes are also performed.

In tap produced habituation, the stimulus is normally deliver in normal intervals like 1m for about 10 or more stimulus demonstration.[4]

B. Conditioned Place Preference

This is a process sometime mixed with self-administration even though a markedly dissimilar implement for evaluating the appetitive features of a drug agent, is a conditioned place preference(CPP). CPP designates the assortment choices by the zebrafish to a location where it earlier experienced an effect of a drug agent. This is probably a prearrangement theoretically in the associatory mechanisms and eventually measures an organism's potential ability of memory power and learning. Though because apparently what is learnt in CPP procedure is a connotation between the environmental indications and gratifying effect of the drug. Therefore, the CPP assessment potential is often defined purely as a tool to evaluate the rewarding value of the drug agents.

A distinctive CPP preparation in zebrafish models as with rodents comprises of the differential pairing of the binary dissimilar surroundings with the drug's stimulus of effect. The atmosphere that have been paired with with the drug agents attains secondary rewarding possessions.

C. Behavioural Avoidance Learning

Both the active evasion (In which the animal acquires a distinct response, and will result in avoidance of a harmful aversive stimuli that is being carried) and also passive avoidance (In which the animal acquires to evade an environment that is previously being paired with an aversive stimuli) learning criteria has been conventional in the zebrafish model. [5-6]

In these assessments, the behavioural avoidance learning is stereotypically conditional by the total times being spent in exterior of the compartment earlier connected with an aversive stimulus.

D. Spatial and Visual Discrimination.

Spatial memory assessment tools like T maze, Y maze, hole board maze, vertical-plus shape maze) and visual parameters (colour/pattern,etc) judgement measures has been incorporated to portray the operant learning capabilities in zebrafish model, i.e its understanding of the process of fortification and also punishment.

T and Ymaze are simple approaches for placing an operant eventuality, and also it requires the attainment of a spatial discernment. As an instance, if zebrafish makes a right response (eg. swimming through the central lane, then turning left and entering the rewarding compartment) then the delivery of food or an image of the specific (appetitive stimuli) is being initiated.

Then the precision and the latency of involving in the right response can be evaluated, and the assumptions about learning and memory are drawn. Thus T and Ymaze measures prospective tap comparable spatial discernment as hole board apparatus or even plus maze.[5-8]

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