

## Zebrafish as Animal Model in Veterinary Research

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### ABSTRACT

Animal models are used extensively in medical research to better understand the origins of both human and animal diseases as well as to facilitate the creation of novel treatments. Though rodents are still the most popular study model used globally, zebrafish (*Danio rerio*) models have rapidly gained popularity among scientists in recent years. This is due to the fact that a little tropical freshwater teleost fish shares significant physiological, anatomical, and genetic similarities with mammals.

### Introduction

Based on evolutionary research of the fish and human genomes, which reveals that the neurological, cardiovascular, and digestive systems of fish and humans have similar anatomy and physiology, the zebrafish (*Danio rerio*) is a viable model for developing specific medications for use in treating human disorders [1]. The majority of studies on this subject have found that both acute and long-term antibiotic exposure affects the health of zebrafish as well as its ability to adapt to environmental changes. Proteomic and transcriptome sequencing, behavioral activities and biomarker analysis, histopathological analysis of various tissues, fish lethality assays (LC50), and monitoring fish morphological changes were used to investigate the toxicological effects of single and mixed antibiotics in zebrafish [2]. Zebrafish also offers a huge data set for animals, allowing scientists to obtain accurate observations at anatomical, physiological, and behavioral levels to biochemical, genetic, and cellular hypotheses [3]. The zebrafish model enables testing to be conducted quickly, starting at the embryonic stage and continuing for only three months until the adult state (Fig 1). Additionally, the daily expense for the zebrafish was 0.16 US dollars as opposed to 2.15 US dollars for rodents like mice and rats etc. [4].

### Zebrafish in Food Safety Research

The striking similarity in toxicity profiles between humans and zebrafish has led to the widespread applications of zebrafish as an *in vivo* model in a variety of scientific research areas, including toxicology and drug discovery. Zebrafish's strong physiological, anatomical, and genetic similarity to human genes results in a higher similarity (over 70%) in the genetic information that has been sequenced [6]. The zebrafish model can be very useful as animal model research trails that are based on the screening of harmful food chemicals for their integrative physiology [7]. Many studies have been conducted in recent years which used zebrafish in food security research like different preservatives like sodium nitrite and nitrate [8] and methylparaben [9].

### Zebrafish for Use in Cancer Research

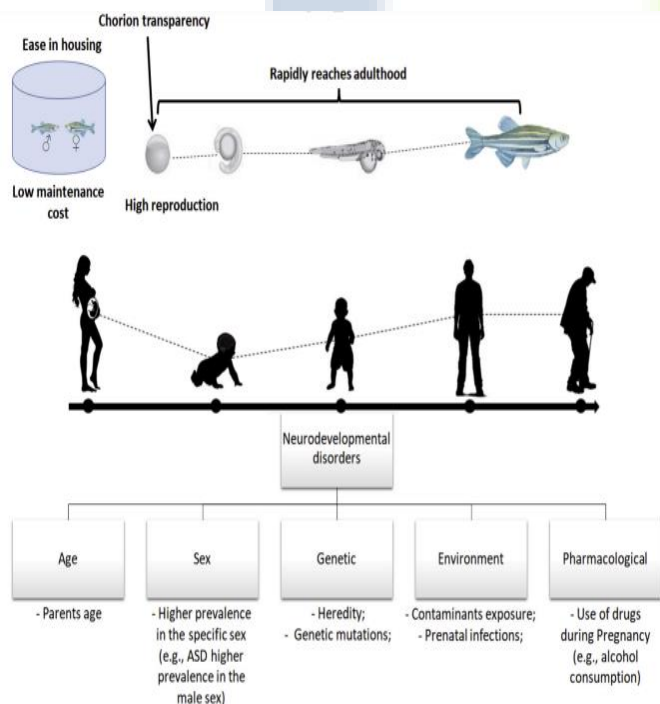
Zebrafish have become a real animal tool for modelling cancer in humans. In respect to human malignancies, it is being utilized to examine the growth of tumors in a number of organs. This model investigates the genetic resemblance between human malignancies and zebrafish cancers in terms of their shape, histology, physiology, and genetic makeup. This methodology allows for the design and customization of new drugs as well as cancer therapy research. When using zebrafish as an animal model for cancer, research instruments may be used for relatively short periods of time, and little amounts of medication can be transparently examined and have a high degree of predictability. It is important to emphasize that the zebrafish cancer model offers appropriate underlying and distinctive insights into cancer-related pathways. Based on the underlying processes, it could offer potential cancer chemo preventive activities [10].

### Conclusion

In comparison to other animal models used to simulate diseases of mankind, zebrafish have a number of benefits. Specifically, this is valid for extensive gene mutations and therapeutic chemical screens, as well as other research trials in biomedicine. The study of the molecular pathways behind human genetic illnesses is progressing more quickly thanks to the significant advancements made in cutting-edge sequencing technologies and disease modelling in zebrafish. These initiatives are essential for the development of specific medicine as they aid in fresh diagnostic and treatment options.

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**Fig 1: Schematic diagram emphasizing the advantages of using zebrafish to study neurodevelopmental disorders and their risk factors [5]**

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