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Transposable elements: Strategies and mechanism of transposition in *Danio rerio*, a genetic model

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Zebra fish (*Danio rerio*) is an excellent model animal to study vertebrate development by various genetic approaches. External development and transparent nature of its embryo makes it feasible to visualize and manipulate a cell in the living organism. Genetic engineering is well suitable in this organism due to the availability and easy collection of large number of embryos from the adult fish. Several approaches have been implemented to manipulation the zebra fish at DNA, RNA and protein level by employing different technologies (EMU and trapping based mutagenesis, TILLING, site specific recombination, transgenics and so on). Identification of several transposon in this model organism has opened the doors for genetic manipulation with a new approach which can be effectively used in other animals. Taking these into consideration it can be used in transgenic development which would increase sustainability by manifolds in term of production and vigour traits production. This study highlight the recent developments in the field of insertional mutagenesis in zebra fish, the mechanisms and concepts of new transposon-based mutagenesis approaches under development which may be used as reference approach for adopting in commercially important fish or gene silencing for disease diagnosis in higher vertebrates . This review is an eye opening signal for researcher which would ignite deep interest to carry forward these modern tools and techniques to address the short falls of genetic improvement strategies indispensable for sustainable aquaculture.

Key words : Zebra fish, (*Danio rerio*), Transposones, Mutagenesis, Genetic model, Gene trapping

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INTRODUCTION

Transposons or transposable elements (TEs) are sequences of DNA that can move around to different positions within the genome of a single cell; the process of their movement is called transposition. The event of transposition can cause mutations and change in the size of genome. TEs make up a large fraction of genome, which is evident through the C-values of eukaryotic species and these elements are part of sheer volume of seemingly useless material termed as "Junk DNA". Barbara Mc Clintock discovered TEs, early in her career for which she was awarded a Nobel Prize in 1983. TEs are present both in prokaryote and eukaryotes. The mobile genetic elements can be grouped based on their mechanism of transposition into Class I and Class II TEs. Class I mobile genetic elements, or retrotransposons, transpose themselves by being first transcribed into RNA, then require enzyme reverse transcriptase to transcribed back into DNA, travel to another position at the accepter site, and integrate into the genome. However, class II mobile genetic elements move directly from one position to another using an enzyme transposase to "cut and paste" themselves at donor and acceptor site, respectively within the genome. Similarly, based on their self sufficiency to transpose, TEs can also be categorized into autonomous TEs and have sequence which encodes for transposase and are self sufficient to transpose and integrate into the genome whereas non autonomous TEs require the transposase from other source for their transposition, non autonomous transposons.

The recent introduction of several transposable elements in *Danio rerio* (zebra fish) opens new frontiers for genetic manipulation in this important vertebrate model. This article discusses TEs as mutagenesis tools for fish