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Editorial

Fishing Fish Stem Cells and Nuclear Transplants

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Abstract

Fish has been the subject of various research fields, ranging from ecology, evolution, physiology and toxicology to aquaculture. In the past decades fish has attracted considerable attention for functional genomics, cancer biology and developmental genetics, in particular nuclear transfer for understanding of cytoplasmic-nuclear relationship. This special issue reports on recent progress made in fish stem cells and nuclear transfer.

Key words: fish, medaka, zebrafish, stem cell, nuclear transfer

Fish is the largest group of vertebrates and comprises more than 25,000 living species, which is comparable to the total number of land vertebrate animals. Traditionally, fish has been the subject of various research fields, ranging from ecology, evolution, physiology and toxicology to aquaculture. In the past decades, fish has attracted considerable attention for functional genomics, cancer biology and developmental genetics, in particular nuclear transfer for understanding of cytoplasmic-nuclear relationship. With the establishment of laboratory fish models such as zebrafish and medaka, much progress has been made with fish stem cells and nuclear transfer, the topic of this special issue. For example, fish has been the first animal that has given rise to embryonic stem (ES) cells outsides mouse [1], and represents the first and only animal that has produced haploid ES cells capable of whole animal production through semi-cloing [2].

In this special issue, there are three reviews and four research articles on fish stem cells. Hong et al. present a timely review on fish stem cell culture and transplantation [3], Nakamura et al. summarize their recent work on ovarian germ stem cells in vivo [4], and Sánchez-Sánchez et al. provide an overview on fish pluripotency genes nanog and oct4 from medaka [5]. Li et al. report the capability of medaka cleavage embryos for generating ES-like cell cultures [6], as a step to derive stem cell cultures from earlier stages than currently used. Wang et al. report the identification of seven pluripotency genes in the medaka by examining their expression in ES cell cultures before and after induced differentiation [7]. Rao et al. find that the expression and activity of medaka telomerase is versatile in vivo and in vitro, but the expression of different transcript variants appears to be associated with pluripotency and differentiation in vitro and in vivo [8]. Zhang et al. report the establishment and characterization of a testicular cell line from a marine fish called the half-smooth tongue sole, as a step towards the study of germ stem cell behaviors in vitro [9].

Fish has long been used for nuclear transfer. As early as 1986, exact 10 years before the birth of Dolly the cloned sheep, Chen et al. succeeded in the generation of a sexually matured nuclear transplant crucian carp from a cultured adult cell. This work was published in Chinese and largely ignored by the scientific community, until its recent republication [10]. In this special issue, there are three original articles on fish nuclear transfer. Luo et al. report critical developmental stages for the efficiency of somatic cell nuclear transfer in zebrafish [11], Hattori et al., report the production of fertile zebrafish nuclear transplants in non-enucleated eggs [12], and Liu and Hong report sperm nuclear transfer and transgenic production in the medaka [13].

Fish is an excellent system for chromosome set manipulations. Naturally occurring and experimentally induced parthenogenesis (namely gynogenesis - all-female development, and androgenesis - all male development) and polyploidy can survive and reach the adulthood, and more importantly, even undergo sex maturation to produce progeny. Luo et al. report massive production of all-female diploids and triploids in the crucian carp for aquacuture [14].

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Conflict of Interests

The author has declared that no conflict of interest exists.

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