

FISH AS A MODEL ORGANISM TO STUDY SKELETAL DEVELOPMENT AND ASSOCIATED PATHOLOGIES

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The physiological and molecular processes that regulate early cell differentiation and maturation, matrix deposition, morphogenesis and maintenance are under strict control during ontogenic skeletal development of vertebrates. A large research effort on the sequencing and genetic characterization of model fish such as zebrafish, medaka, fugu or seabream in the last two decades has provided numerous studies at various levels on the regulation of skeletal formation and demonstrated that similar developmental events occur both in mammalian and non mammalian systems. It is apparent that most of the regulatory factors or molecular pathways that control bone formation have been highly conserved in vertebrates during evolution, and it is known that signaling molecules required for embryonic skeletal development are also important for adult skeletal homeostasis. Fish and other non mammalian vertebrates offer unique opportunities to perform studies which are either more difficult or not possible to perform in mammals. Indeed, most model fish organisms have a large fecundity, being able to lay several hundreds or thousands of eggs, a short generation time and an external development with translucent eggs that allow visualization of developmental events and easy manipulation of cells and growing embryos. Recently developed techniques of reverse genetics, along with the facility to generate stable transgenic fish lines and the availability of a large amount of mutants identified during large scale screenings with ENU-induced mutations, allowed the identification of numerous genes involved in skeletogenesis and various parallelisms between these mutants and genetic diseases in humans have been established. Presently zebrafish is being used as a model in numerous fields from pharmacology to immunology and cancer research. This presentation will give an overview of the ongoing research and recent advances in fish skeletal biology and on the applications of this system to human biomedical studies.