Zebrafish oncomiR-based MAFLD models: from pathophysiological mechanisms to translational medicine

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Because of powerful genetic technology, the zebrafish is an excellent model for studying embryonic development and defects. Zebrafish have been extended as a model organism to study human diseases and have been analyzed as a mechanism of cancer formation within different organs. Over the past 15 years, we have become intensely interested in several critical niche areas in zebrafish liver disease models; my research team builds up epigenetics studies using zebrafish as disease models for studying metabolic diseases such as arteries atherosclerosis, obesity, diabetes, NAFLD or NASH, HCC, and cancer cachexia, etc. Recently, zebrafish have emerged as a valuable model for studying metabolic-associated fatty liver disease (MAFLD), especially in the context of cancer-related microRNAs (oncomiRs). This study explores the use of zebrafish in developing oncomiR-based MAFLD models, bridging the gap between pathophysiological mechanisms and translational medicine. Zebrafish offer several advantages, including genetic similarity to humans, transparency during early development, and the ability to produce large numbers of offspring rapidly. These characteristics make zebrafish an ideal model for studying the complex interactions between oncomiRs and liver pathology. OncomiRs, microRNAs associated with cancer progression, are critical in regulating gene expression related to MAFLD. In zebrafish, specific oncomiRs can be manipulated to induce MAFLD phenotypes, providing insights into disease mechanisms such as lipid accumulation, inflammation, and fibrosis. These models enhance our understanding of the molecular underpinnings of MAFLD and serve as a platform for high-throughput drug screening and identifying potential therapeutic targets. Integrating zebrafish oncomiR-based models into translational medicine holds promise for accelerating the development of novel MAFLD therapies. By offering a more comprehensive understanding of the disease's pathophysiology, these models pave the way for innovative treatments that can be more effectively translated into clinical practice, ultimately improving patient outcomes.