

MicroRNAs Control Gene Expression: Importance for Cardiac Development and Pathophysiology

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ABSTRACT: Growing evidence indicates that microRNAs (miRs) are involved in a variety of basic biological processes, including cell proliferation, apoptosis, stress response, hematopoiesis, and oncogenesis. In fact, bioinformatic analysis predicts that each miR may regulate hundreds of targets, suggesting that miRs may play roles in almost every biological pathway. Recent studies have suggested that miRs are involved in the regulation of cardiac development and pathophysiology. Notably, knockout of miR-1 was associated with cardiac defects including regulation of cardiac morphogenesis, electrical conduction, and cell-cycle control. Our group has identified a critical role of miR-1 and miR-133 in determining cardiac hypertrophy, and showed an inverse correlation of expression with cardiac hypertrophy *in vitro*, in murine models, and in human disease states associated with cardiac hypertrophy. Remarkably, *in vivo* experiments with a single infusion of antagomir-133 oligonucleotide, a small cholesterol-conjugated RNA sequence suppressing endogenous miR, induced marked and sustained cardiac hypertrophy. Therefore, shedding light on the role of this new class of RNA molecules in heart physiology and pathology may reveal possible future therapeutic applications for the treatment of heart diseases.

KEYWORDS: MicroRNA, cardiac hypertrophy, heart disease, antagomir

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