Harnessing extracellular vesicles for treating myocardial infarction

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Abstract

Myocardial infarction (MI) is a leading cause of mortality worldwide. Cell therapy holds great promise, but its effectiveness has been limited by poor uptake, retention, and survival of donor therapeutic cells at the injured myocardium. Evidence now suggests that paracrine secretions from donor cells, rather than differentiation or integration with host tissues, are the primary drivers of therapeutic effects. In particular, extracellular vesicles (EVs) appear to offer similar therapeutic outcomes as cell therapy, with less complexity and risk. EVs contain diverse and dynamic mixtures of microRNAs, proteins, lipids and metabolites that can have wide-ranging effects on recipient cells; both beneficial and detrimental.

This talk shares insights from our ongoing work, emphasizing practical applications. I will discuss our use of biomaterials to improve cell retention and streamline EV delivery to MI sites. Additionally, we are recently exploring accessible EV sources like human platelet lysates and cardiac stromal cells derived from surgical waste tissues, aiming for clinically-feasible advancements. Our recent efforts focus on understanding the cardioprotective mechanisms of EVs through various models, such as cardiomyocyte hypoxia/reoxygenation injury, cardiac microvessel angiogenesis, and macrophage stimulation. Integrating EV miRNA profiling and proteomics with target cell transcriptomics, our research aims to understand the complex, combinatorial mechanisms of EV action.