Innovating extracellular vesicles for cardiac repair

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Extracellular vesicles (EVs) function as a mode of intercellular communication and molecular transfer to elicit diverse biological/functional response. As therapeutic modalities EVs hold great promise due to their endogenous characteristics in transport and transfer of functional components to target cells[1]; however, further bioengineering refinement is required to address clinical and commercial limitations[2,3]. EVs are important components of paracrine signaling in stem/progenitor cell-based therapies, are employed as standalone therapies, and can be used as a drug delivery system[3]. Despite remarkable utility of native/biological EVs, they can be improved using bio/engineering approaches to further therapeutic potential. Our research program involves understanding and harnessing native EVs and integration of mass spectrometry-based proteomics with the goal of identifying new deliverable therapeutic targets. Here, we present insights into development of scalable approach to generate functional nanovesicles for cell-dependent cardiac repair[4]. We highlight the capacity of nanovesicles to improve three-dimensional cardiac organoid function in a post-injury/hypoxic model and induce organoid proteome reprogramming of cardiac-/angiogenic-related proteins to support repair functions. Our results indicate that stem cell-derived nanovesicles are a promising functional and potent therapeutic surrogate for native EVs for tissue repair.

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