Lipoplexes for miRNA delivery in myocardial regeneration

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Myocardial infarction is one of the major causes of mortality in industrialized countries. Several strategies have been studied to regenerate myocardial infarction, reaching a limited success [1].
Direct reprogramming of cardiac fibroblasts populating post-infarct scar into cardiomyocytes could represent an alternative promising approach [1-3]. In 2012, mouse fibroblasts transfected with a combination of four microRNAs (miRNAs), termed “miRcombo”, were transdifferentiated into cardiomyocytes [1-3].
In this work, nanotechnology-based approaches were explored to efficiently deliver miRNAs to human cardiac fibroblasts in the perspective of their direct reprogramming. Lipoplexes containing negmiR or miR-1 (miRVana™ miRNA Mimic, Life Technologies) were prepared at different N:P ratios (3.0; 1.75; 0.70; 0.35). Lipoplexes showed an average size between 405 nm and 560 nm and an average zeta potential between +21 mV and -29 mV. Encapsulation efficiency and morphology (cryoTEM) were also analyzed.
In vitro tests with human cardiac fibroblasts showed a significantly higher miR-1 expression in the case of transfection with lipoplexes compared to a commercial agent, as evaluated by digital droplet PCR.
As a conclusion, in this work new lipoplexes were developed showing efficient delivery of miR-1 to human cardiac fibroblasts, for future use in direct reprogramming.

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