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Poly (ethylene oxide): A polymer for tissue regeneration and repair

Mehrnaz Moattari, and Farahnaz Moattari
Kharazmi University, Iran

In the past two decades, tissue engineering has made significant advancements. Synthetic polymers as one of the main components of biomaterials are progressively scrutinized as potential scaffolds for tissue repair and/or regeneration. Poly (ethylene oxide), a synthetic polymer with several biomedical applications is biocompatible and has the ability to release growth factors in a regular manner. In a study, poly (ethylene oxide) was delivered into the myocardium in a rat model of myocardial infarction and it was shown that using this polymer improved wall thickness. In addition, using poly (ethylene oxide) functionalized with vinyl sulfones and mixed with dithiothreitol causing non-degradable injectable Poly (ethylene oxide) polymer. The polymers were delivered two minutes after myocardial infarction in a rat model and four weeks after the operation it was demonstrated that the wall thickness was significantly upgraded. Furthermore, Injection of a non-degradable poly (ethylene oxide) polymer to the site of myocardial infarction in a male Wistar rat model was effective immediately in alleviating pathological remodeling in the healing phase after myocardial infarction. It should be mentioned that this process had an undesirable effect, that was an inflammatory reaction due to macrophages. Also, it is reported that seven days after myocardial infarction, the encapsulation of bone marrow-derived stem cells in a α-cyclodextrin/ poly (ethylene oxide) – polycaprolactone polymer and delivering this combination concurrently delivering of an α-cyclodextrin solution containing bone marrow-derived stem cells and poly (ethylene oxide) – polycaprolactone into the site of the infarction. Four weeks after the operation, the histological assessment was done. It showed that the polymer was absorbed. Also, cell retention and the number of vessels in the infarcted tissue were increased significantly and the function of the left ventricle was improved. To solve the problem of cardiovascular disease, tissue engineering and biomaterials are progressively scrutinized as potential candidates for cardiovascular regeneration and repair. Poly (ethylene oxide) can be considered as a promising approach for repair and/or regeneration of cardiovascular tissue after myocardial infarction.

mhr.moattari@gmail.com