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Surface Modification of Fibroblasts with Peroxiredoxin-1-loaded Polymeric Microparticles Increases Cell Viability and Collagen I Production

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Modifying the cell surface with artificial nano- and microparticles containing biologically active payloads usually enables drug targeting via harnessing intrinsic cell tropism to the injury sites. In some cases, using cells as delivery vehicles leads to improved pharmacokinetics due to the extended circulation time of cell-immobilized formulations. Another rationale for particle attachment to cells is the augmentation of desirable cellular functions and cell proliferation in response to the release of the particle contents. In this study, we conjugated PLGA-based microparticles loaded with multifunctional antioxidant enzyme peroxiredoxin-1 (Prx1) to the surface of fibroblasts. Obtained microparticles demonstrated high uniformity in size and sustained protein release. We found that the released Prx1 maintains its signaling activity, resulting in macrophage activation indicated by TNFα upregulation and increased ROS generation. Functionalization of fibroblasts with PLGA/Prx1 microparticles via EDC/sulfo-NHS coupling reaction did not affect cell viability and migratory properties. In summary, we have developed a novel approach of fibroblast modification to augment biological properties of these cells relevant to cosmetic dermatology, reconstructive surgery, and tissue engineering.