Electrospinning Nanodiamond FIber Patches for the Prevention of Secondary Myocardial Infarctions

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The team sought to create a polymer fiber material that would serve as a viable drug delivery system for the diffusion of Vascular Endothelial Growth Factor Alpha (VEGF) on the human heart as a secondary prevention measure against myocardial infarctions. There were three phases of development: (1) basic patch fabrication with proper materials, (2) Chemical and mechanical strength optimization, and (3) incorporation of VEGF. PEO, PETA, nanodiamond, and the photoinitiator Irgacure 184, which were added throughout the development process to ensure maximum chemical and mechanical strength, demonstrated through integrity of patches in solutions and, later, tensile strength testing. The thickness of the patches was also increased while maintaining minimum levels of electrospray and charge buildup on the patches. Finally, various methods of VEGF integration were employed to determine the best possible method of incorporating the protein. Patches were shown to have the capability to survive and flex with the movement of a rat heart in practical application. The use of patches for prevention of secondary myocardial infarction is very promising.

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