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Nanotechnology-Enabled Stem Cell Delivery for Regenerative Medicine**Wei Zhang**

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One of the major challenges in regenerative medicine is ensuring efficient delivery and survival of transplanted stem cells at the site of injury. Nanotechnology has emerged as an innovative solution by improving cell targeting, enhancing therapeutic efficacy, and providing controlled delivery of bioactive molecules. This presentation highlights recent developments in nanoparticle-based drug delivery systems, nanofiber scaffolds, injectable hydrogels, and biodegradable nanomaterials designed to support stem cell survival and differentiation. Nanomaterials can mimic the natural extracellular matrix, improving cell adhesion, proliferation, and tissue integration.

Studies have demonstrated significant benefits in cardiac repair, neural regeneration, bone healing, and cartilage reconstruction through the combined use of stem cells and nanotechnology. Functionalized nanoparticles can

also deliver genes, growth factors, and signaling molecules directly to transplanted cells, enhancing regenerative capacity while minimizing systemic side effects. Safety, long-term biocompatibility, and regulatory approval remain important considerations before widespread clinical implementation. Continued collaboration between material scientists, engineers, and clinicians will be essential for translating these technologies into routine medical practice. Nanotechnology is expected to become a key component of next-generation regenerative medicine by enabling more precise, efficient, and personalized stem cell therapies.

Biography

Wei Zhang is a biomedical engineer specializing in Nano medicine and regenerative biomaterials. His research integrates nanotechnology with stem cell biology to develop advanced therapeutic delivery systems for tissue regeneration.