Advanced Nanomedicine Therapies for Burn Wound Management

Burns are typically believed to be skin wounds, mainly including thermal burns (due to thermal/heat exposure), chemical burns (caused by chemical substances), and radiation burns (due to exposure to ultraviolet light, ionizing radiations such as X-ray, microwaves, etc.). The management of burn wounds continues to be a difficult and daunting challenge, as existing therapies have largely failed to produce appropriate wound healing results. Therefore, novel approaches and strategies for treating burn injuries are desirable in order to promote faster healing by minimizing infection, moisturizing the wound, accelerating the healing processes to achieve satisfactory healing that preserves function, and minimizing scar formation with minimal discomfort and cytotoxicity [1-4].

In recent years, nanotechnology has been an invaluable resource for the development of new multifunctional nanomaterials and nanocarrier systems, as well as the constant revolutionization of burn wound therapy. It has enormous promise for enhancing the therapeutic efficacy of drugs due to its capacity to inhibit drug degradation and sustain drug release. As the sustained drug release prolongs the maintenance of effective drug concentration, it minimizes the frequency of dosing and leads to cost-effective therapy with better patient compliance. In burn wound therapy, mainly two types of nanomaterials are used: (1) First demonstrates intrinsic properties advantageous for wound management and (2) Second one is considered as a delivery carrier for drugs [1-4].

Nevertheless, a number of drug delivery systems (n-DDSs) encapsulating therapeutic agents have been developed, exhibiting unique characteristics and multiple functions. These systems primarily consist of liposomes, lipid nanoparticles, polymeric nanoparticles, metallic nanoparticles, carbon-based nanomaterials, nanofibrous structures, nanohydrogel, etc. Moreover, these n-DDSs have demonstrated the ability to: 1) enhance the selectivity of therapeutic agents; 2) minimize the toxicity of drugs to normal cells/tissues, and thus, reduce their toxic side effects; 3) improve the solubility of practically insoluble drugs (e.g., silver sulfadiazine) or hydrophobic drugs; and 4) provide a prolonged and controlled release of therapeutic agents [5-7].

However, the obstacle lies in gathering adequate information on the physicochemical attributes of the nanoparticulate systems and their anticipated performance and toxicity to healthy cells/tissues. In this context, the current thematic issue discusses the recent advances in n-DDSs development for burn wound therapy with a particular emphasis on the metallic nanoparticle, polymer, lipid-based nanotherapeutics and nanofibrous structures for burn wound management, different strategies for site-specific controlled delivery, and next generation challenges of such types of n-DDSs [1, 3, 5-9].

REFERENCES


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