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Advances in Nanomaterial Based Wound Healing Agents

Wound healing mainly comprises of four stages homeostasis, inflammation, proliferation, and remodelling. Any disturbance in this process results in chronic wound. Wound colonization with pathogenic microorganism and formation of biofilm delays wound healing. An antimicrobial wound dressing to prevent microbial invasion and promote wound healing is desirable. Conventional wound dressings are dry in nature, uncomfortable and have poor patient compliance. The have to frequently changed, which in turn disturbs the wound bed. Nanomaterial-based approaches are intended to develop novel antibacterial agents that could kill pathogenic bacteria. Metal or metal oxide nanoparticles (e.g., Ag, Au, and ZnO) were synthesized for intrinsic antibacterial activity and potential wound-healing properties. Functionalized nanocarriers like liposomes, have been designed to deliver therapeutic agents to the target site. The process of wound healing can be monitored with near-infrared (NIR) light or alternate magnetic field (AMF) using Au, γ -Fe₂O₃, or Fe₃O₄ nanoparticles. Commercially available Ag NPs-based wound-dressing products are Aquacel Ag, DynaGinat AG Silver Calcium Alginate Dressing, CuraFoam AG Silver Foam Dressing, DynaFoam AG Bordered Silver Foam Dressing, Biatain Alginate Ag, and SilverIon are commercially available. Conjugates of Ag NPs with biopolymer (ABP) such as collagen, gelatin, silk, keratin, chitosan, starch, cellulose, and hyaluronic acid have also proved to be non-cytotoxic and commonly accepted as Generally Recognized as Safe (GRAS). Significant research work has been witnessed with other metal and metal oxides including gold, zinc, copper, titanium, magnesium oxide (MgO), iron oxide (Fe₂O₃), aluminium oxide (Al₂O₃), and copper oxide (CuO) for developing improved wound-healing biomaterials.

Biography

Dr. Dimple Sethi Chopra is presently working as Associate Professor (Pharmaceutics) in Department of Pharmaceutical Sciences and Drug Research, Punjabi University, Patiala. Her present areas of interest are biopharmaceutics, pharmacokinetics, green nanotechnology, molecular nanotechnology, targeted drug delivery, nanobiotechnology and nanomedicine. She has been granted two Indian patents on brain permeable nanoparticles. She has several international publications to her credit. She is an invited manuscript reviewer of many international journals like Drug Discovery today, Journal of Nanoparticle Research, drug delivery, seizure, Open Access Rheumatology: Research and Reviews, International Journal of Nanomedicine, Drug Design, Development and Therapy. She is an editorial board member of many international journals. Her upcoming book publication is Strategies to Overcome Superbug Invasions. Emerging Research and Opportunities.

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