

Nanoparticles to accelerate wound healing

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In humans, especially adults, healing is a complex process involving several phases, such as the haemostasis phase (activation of repair and blood clotting system), defensive phase (destroying bacteria and removing debris), proliferative phase (filling and covering of a wound involving contraction of wound margins) and maturation phase (formation of new tissue). As healing involves several phases, the process of healing is time-consuming. To accelerate the wound repair mechanism, innovative strategies that focus on the properties of noble metals, such as gold and silver have been formulated. Since ancient times, it is believed that these metals have healing properties and protect the skin and body from toxins. However, as gold is expensive, it is more convenient to develop a strategy using silver nanoparticles for repair and healing purposes. Some of the properties of silver nanoparticles include stimulation of cell proliferation, relocation of human keratinocytes and the regulation of the differentiation of fibroblasts cells into myofibroblasts, which promotes wound contraction, leading to faster healing. Prevention of bacterial accumulation over the affected area is another major concern while treating skin wounds. Silver atoms have a high affinity for sulphur and phosphorus which are the main constituents of DNA, hence silver atoms have the ability to bind with cell constituents and destroy the bacterial cells, causing a bactericidal effect. As the binding of silver nanoparticles leads to the denaturation of DNA, it also helps inhibit the bacterial replication process. Therefore, several advantages of silver nanoparticles have led to an idea involving the usage of silver nanoparticles in ointments as well as to form wound dressings using bioactive materials, synonymous with band-aids that are utilised in wound repair. Hence, a wide range of novel biomedical products can be developed using silver nanoparticles which have a promising future in the pharmaceutical field.

Keywords: Silver nanoparticles, Wound healing, Cell proliferation, Noble metals, Bactericidal effect

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