



## **Novel Gold Nanocomposite for Wounds Healing in Rats: Effect of Nanoparticles' Shape and Surface Chemistry**

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### **Abstract**

Wound healing is a natural and well-organized process. In this study, gold nanoparticles (GNPs) of different shapes (rods and spheres) and different surface chemistry (neutral, cationic and anionic charge) were synthesized, characterized and loaded into a thermosensitive gel (poloxamer 407). The results revealed that GNPs loaded into poloxamer 407 gel exhibited an excellent colloidal stability and demonstrated slow and prolonged release over 48 hr of exposure using in-vitro model. Furthermore, poly ethylene glycol (PEG)-gold nanorods (GNRs) and poly allyl amine hydrochloride (PAH)-GNRs showed remarkable wound healing properties upon topical application on wounds using animal model. PEG and cationic charged GNRs have accelerated the collagen deposition after 14 days of daily treatment compared to controls, and they demonstrated a potent antibacterial activity against *staphylococcus aureus* (*S. aureus*) and *Pseudomonas aeruginosa* (*P. aeruginosa*), which are considered the most common bacteria responsible for skin infections. Furthermore, the results

showed that PEGylated GNPs were highly deposited into the main body organs compared to the charged counterparts (PAH and poly acrylic acid (PAA) coated) which demonstrated very low percentage of gold accumulation. GNRs loaded into a thermosensitive gel could be a promising platform for healing of wounds.