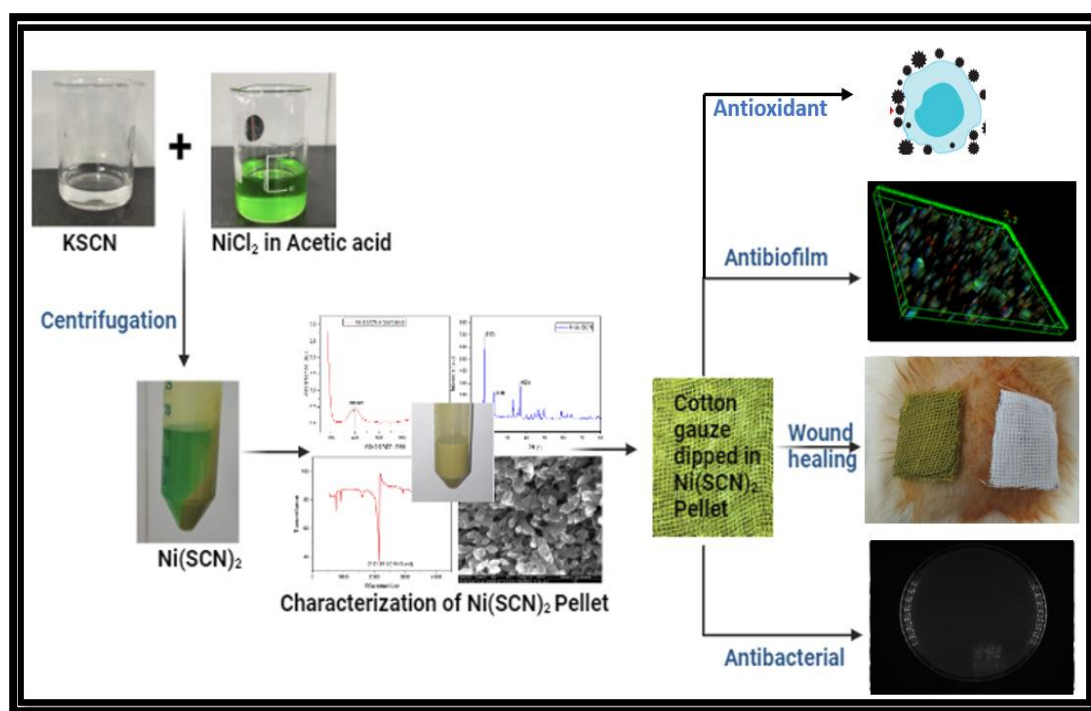


# Multifunctional (4-in-1) Therapeutic Applications of Nickel Thiocyanate Nanoparticles Impregnated Cotton Gauze as Antibacterial, Antibiofilm, Antioxidant and Wound Healing Agent

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**Abstract:** The wounds, arises from accidents, burns, surgeries, diabetes, and trauma, can significantly impact well-being and present persistent clinical challenges. Ideal wound dressings should be flexible, stable, antibacterial, antioxidant and anti-inflammatory in nature, facilitating a scarless rapid wound healing. Initiatives were taken to create antibacterial cotton fabrics by incorporating agents like antibiotics and metallic nanoparticles. However, due to lack of multifunctionality these materials were not highly effective to cause scarless and rapid wound healing. In this article, nickel thiocyanate nanoparticle (NiSCN-NPs) impregnated cotton gauze wound dressing (NiSCN-CG) was developed. These nanoparticles were non-toxic to normal human cell lines till 1 mg/mL dose and did not cause skin irritation in the rat model. Further, NiSCN-NPs exhibited antimicrobial, antibiofilm and antioxidant activities confirmed using different in vitro experiments. In vivo wound healing studies in rat models using NiSCN-CG demonstrated rapid scarless wound healing. The nickel thiocyanate impregnated cotton gauze presents a novel approach in scarless wound healing, and as an antimicrobial agent, offering a promising solution for diverse wounds and infections in the future.



**Scheme 1:** Graphical abstract of synthesis, characterization and biomedical application of NiSCN-CG as antioxidant, antibacterial, antibiofilm and wound healing agent.