**Piperine-loaded lipid-based nanocarrier for the treatment of Diabetic Wound**

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**Background and aims.** Diabetes mellitus, a chronic metabolic disease that affects several organs, is usually associated with delayed wound healing, particularly in the lower extremities, which can develop to chronic wounds and need lower limb amputation. The increasing global incidence of diabetes highlights the critical need for enhanced wound care treatments that can precisely mimic the natural extracellular matrix, reduce inflammation, and control microbial infections. This work focuses on building a lipid-based nanocarrier technology to improve diabetic wound treatment, with the goal of effectively addressing these problems.

**Methods.** Nanoemulsion were prepared by ultrasonication method, employing oleic acid as the ery component. The active pharmaceutical ingredient was piperine (PIP). The in-vitro parameters were evaluated via particle size, PDI, zeta, FESEM, XRD, DSC, in-vitro drug release and stability study. The anti-inflammatory, biochemical assays and antioxidant studies were evaluated. In-vivo diabetic wound healing was evaluated on the SD rats. Biocompatibility was assessed through hemocompatibility and cytocompatibility.

**Results.** The prepared Nanoemulsion showed the 87.53% entrapment of PIP. The particle size of the PIP loaded formulation was less than 200 nm. The in-vitro evaluation of the results showed that the Nanoemulsion was passing the tests and observations was coming under the acceptance criteria. The in-vitro release showed the sustain release of drug and up to 95% of drug released from the formulation after the 8 h. The Nanoemulsion also showed antimicrobial and anti-inflammatory properties, contributing to tissue regeneration by modulating cytokine levels, reducing oxidative stress, and reducing the risk of secondary infection in diabetic wounds. Hemocompatibility assessments confirmed the biocompatibility of the Nanoemulsion. The in-vivo diabetic wound healing showed that the PIP loaded emulsion heal wound faster than the standard treatment.

**Conclusion/Discussion.** The developed PIP loaded Nanoemulsion pass all the evaluation parameters. The PIP loaded Nanoemulsion demonstrated synergistic bioactivity, effectively inhibiting bacterial growth and supporting tissue regeneration. The prepared Nanoemulsion is the novel strategy for the treatment of diabetic wound healing.

**References:**

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