

## ARTIFICIAL INTELLIGENCE GUIDED GREEN TECHNIQUE: DEVELOPMENT OF LIPID NANOPARTICLES AND ANTI-PSORIATIC ACTIVITY

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**Background:** Colloidal lipid nanoparticles (CLN) has become the mainstay for the dermal drug delivery. CLN have established their mark as a biocompatible and biodegradable carrier, convenient for the loading of both the hydrophilic and hydrophobic drug candidates. However, CLN is less explored for the treatment of psoriasis, and the process of production is tedious and expensive, associated with a possibility of contamination and requirement of sophisticated instruments. In the present study, the CLN was prepared by greener and safer alternative technique using microwave irradiation. Tretinoin (TRN), a retinoid, was selected to be entrapped into the CLN. TRN-CLN acts on the fibroblast cells aiding the increase in collagen and simultaneously reducing the progression of inflammation, thus being a valuable treatment for psoriasis.

**Methods:** The microwave irradiation technique was optimized by the application of artificial intelligence (AI) and machine learning (ML), to reduce the requirement of surfactants and prevent the permeation of TRN into the systemic circulation.

**Results:** The optimized CLN had a particle size of < 80 nm, and showed a narrow size distribution, had a surface charge of < -35 mV and entrapment of > 98% for TRN. The AI/ML guided process produced CLN within 2 min, the CLN was stable for 12 months and limited the permeation of TRN into the bloodstream with skin retention of 87%. The *in vivo* studies showed a complete absence of irritation associated with the parent TRN and decreased the epidermal thickness, and the hyperkeratosis a hallmark of psoriasis. The histological features showed a remarked decrease in the accumulation of neutrophils, further confirming the non-irritancy of TRN in CLN.

**Conclusions:** The results of the study demonstrate the utility of microwave irradiation as a greener process for the preparation of CLN and the encapsulation of anti-psoriatic drugs.