

# Mannose Coated Rifampicin-Curcumin-Nanomicelles against *Mycobacterium tuberculosis* †

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**Abstract:** Tuberculosis (TB) is one of the leading causes of death from a single infectious agent. Rifampicin is one of the most effective first-line anti-TB drugs, and curcumin is an antioxidant agent that has been studied to minimize oxidative stress in anti-TB therapy. In the present work, a novel nanocarrier loaded with rifampicin and curcumin for TB treatment was prepared. Soluplus micelles were prepared by aqueous copolymer dispersion, and drug loading was performed by organic solvent diffusion technique. Micelles were coated with mannose and characterized by FT-IR and RAMAN spectroscopy. Micellar size distribution was determined using DLS, and the antioxidant activity was measured by DPPH and ABTS methods. Moreover, *in vitro* microbicidal activity was determined in THP-1 derived macrophages infected with *M. tuberculosis* (MtbH37Rv). Optimal system conditions were achieved, Soluplus 10%, Rifampicin:Curcumin weight ratio 2:1. After drug encapsulation and lyophilization, systems exhibited unimodal size distribution ( $D_h \sim 108$  nm), and they demonstrated *in vitro* antioxidant activity (~62% DDPH and 41% ABTS inhibition). Finally, mannose and curcumin incorporation into the rifampicin-loaded nanoformulation improved its *in vitro* antimicrobial activity against Mtb over 24 h. Hence, this attractive nanotechnological platform demonstrated its potential as a novel nanoformulation for an optimized anti-TB therapy due to its antioxidant and antimicrobial properties.

**Keywords:** nanotechnology; tuberculosis; Rifampicin; curcumin; polymeric micelles; Soluplus.

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## **Conflicts of Interest**

The authors declare no conflict of interest.