

## Combination of Silver-Curcumin Nanoparticle for the Treatment of Root Canal Infection

**Authors :** M. Gowri, E. K. Girija, V. Ganesh

**Abstract :** Background and Significance: Among the dental infections, inflammation and infection of the root canal are common among all age groups. Currently, the management of root canal infections involves cleaning the canal with powerful irrigants followed by intracanal medicament application. Though these treatments have been in vogue for a long time, root canal failures do occur. Treatment for root canal infections is limited due to the anatomical complexity in terms of small micrometer volumes and poor penetration of drugs. Thus, infections of the root canal seem to be a challenge that demands development of new agents that can eradicate *C. albicans*. Methodology: In the present study, we synthesized and screened silver-curcumin nanoparticle against *Candida albicans*. Detailed molecular studies were carried out with silver-curcumin nanoparticle on *C. albicans* pathogenicity. Morphological cell damage and antibiofilm activity of silver-curcumin nanoparticle on *C. albicans* was studied using scanning electron microscopy (SEM). Biochemical evidence for membrane damage was studied using flow cytometry. Further, the antifungal activity of silver-curcumin nanoparticle was evaluated in an ex vivo dentinal tubule infection model. Results: Screening data showed that silver-curcumin nanoparticle was active against *C. albicans*. Silver-curcumin nanoparticle exerted time kill effect and post antifungal effect. When used in combination with fluconazole or nystatin, silver-curcumin nanoparticle revealed a minimum inhibitory concentration (MIC) decrease for both drugs used. In-depth molecular studies with silver-curcumin nanoparticle on *C. albicans* showed that silver-curcumin nanoparticle inhibited yeast to hyphae (Y-H) conversion. Further, SEM images of *C. albicans* showed that silver-curcumin nanoparticle caused membrane damage and inhibited biofilm formation. Biochemical evidence for membrane damage was confirmed by increased propidium iodide (PI) uptake in flow cytometry. Further, the antifungal activity of silver-curcumin nanoparticle was evaluated in an ex vivo dentinal tubule infection model, which mimics human tooth root canal infection. Confocal laser scanning microscopy studies showed eradication of *C. albicans* and reduction in colony forming unit (CFU) after 24 h treatment in the infected tooth samples in this model. Conclusion: The results of this study can pave the way for developing new antifungal agents with well deciphered mechanisms of action and can be a promising antifungal agent or medicament against root canal infection.

**Keywords :** *C. albicans*, ex vivo dentine model, inhibition of biofilm formation, root canal infection, yeast to hyphae conversion inhibition

**Conference Title :** ICMCMID 2018 : International Conference on Medical and Clinical Microbiology, Infectious Diseases

**Conference Location :** Singapore, Singapore

**Conference Dates :** January 08-09, 2018