ZnO nanoparticles coated by Chitosan-Linoleic acid inhibit the Candida growth and Biofilm formation in vitro

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Objective:

Candida species is a potential pathogen due to various unique characteristics such as the ability to change morphology , changing from yeast to hyphal, hydrolytic enzymes and forming biofilm which causing many opportunistic fungal disease. Nowadays, various nanoparticles are produced with antifungal properties although several studies have proven the antifungal property of ZnO nanoparticles. This study has been carried out on reviewing the use of new synthetic component of zinc oxide nanoparticles (ZnO NPs) coated by Chitosan-linoleic acid (CS-LA) and to assess Minimum inhibitory concentration (MIC) of nanoparticles on clinical samples and biofilm formation in vitro.

Materials/methods:

At first the synthesized ZnO NPs coated by CS-LA were identified with X-ray
powder diffraction (XRD), Scanning electron microscope (SEM), Transmission electron microscope (TEM) and Fourier Transform Infrared Spectroscopy analysis (FTIR).Through in vitro tests, the value of MIC and Minimum fungicide concentration (MFC) of nanoparticles and standard and clinical strains of candida were evaluated in comparison with fluconazole as the control group using the CLSI-M27 method. Finally, biofilm formation was studied using MTT assay.

. **Results:**

The results showed that MIC50 of fluconazole and nanoparticle in clinical strains was 64 µg/ml and 128 µg/ml, respectively. The MIC of fluconazole and nanoparticle in *C. albicans* (ATCC10231) was 8µg/ml and 32µg/ml respectively. The MFC of nanoparticle and fluconazole for clinical samples was recorded at similar
level (128µg/ml). MTT results indicated that the capacity of inhibition of biofilm formation was 43.07 % and 36.68 % by ZnO NPs and fluconazole, respectively. (Table1)1

Conclusions:

It is concluded that the new synthesized nanoparticle has appropriate efficacy compared with fluconazole in inhibitory activity on *C. albicans* growth and biofilm formation. As a result, ZnONPs can be introduced as an effective agent for diminishing adhesion capacity of *C. albicans* and biofilm formation. However more in vitro and in vivo investigations are needed.

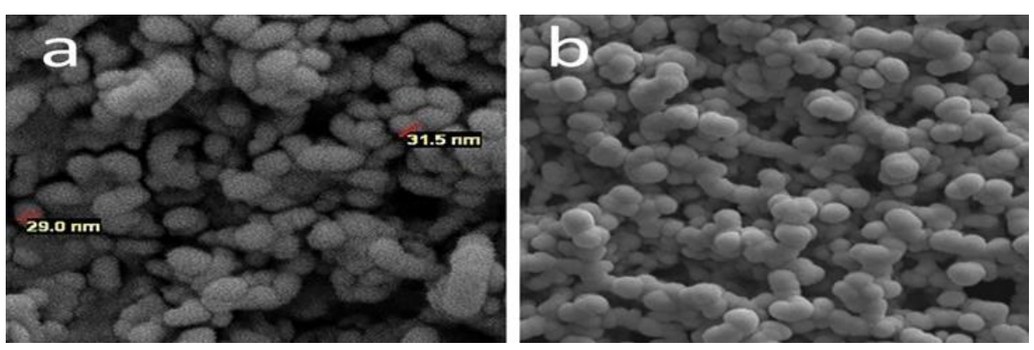

Figure 1. FE-SEM images of ZnO nanoprticles (a)and (b)

Key word:ZnO nanoparticle,Candida,Biofilm inhibition

Table1: The value of MIC and MFC of ZnO NPs and fluconazole against C.albicans

Substance	MTT mean of OD	Percent inhibition of biofilm	MIC50*		MIC Range*	MFC	
			ATCC	Clinical isolates		ATCC	Clinical isolates
Fluconazole	3.15	36.68%	8	64	0.25_128	16	128
ZnO NPs	2.48	43.07%	32	128	0.25_128	64	128

*µg/mL

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