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Nanocomposite of graphen oxide and indolicidin peptide: study of inhibitory effect on Candida albicans and Aspergillus spp.

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Background: Infections caused by opportunistic and saprophyte fungi are the most common disease in patients with decreased immune systems such as organ transplant recipients, AIDS, and long-term use of broad-spectrum antibiotics . Due to increasing drug resistant, the use of natural component with proper antimicrobial effect is improved. This study was performed to determine antifungal activity of Graphene oxide conjugated with Indolicidine as new nanocomposite compared to amphotricin B and fluconazole on standard strain of *C.albicans* and *Aspergillus* spp.

Material/methods: Graphene oxide (GO)was synthesized by Homer method and rise Carboxyl groups on it by C2H3BrO2 and sodium hydroxide and activated by EDC and NHS.Then the cationic antimicrobial peptide (Indolicidin) was added to Graghen for synthesize of nanocomposite that finally confirmed by FTIR , NMR , and SEM analysis. For Minimum inhibitory concentration (MIC) assessment ,*C. albicans*(ATCC 10231) was cultured on SDA medium and incubated at 35^0c for 48 hours and *A.fumigatus*(ATCC204305) , *A flavus* (CBS 625166), *A niger* (ATCC 1105) were cultured on czapek agar medium and incubated at 30^0c for one week . Fungal Suspension were prepared at concentration of 1×10^3 (CFU/ml).MIC and Minimum Fungicide concentration (MFC) were determined by micro dilution broth method with ranges from (200-0.39µg/m)for Nanocomposite, (128-0.25µg/ml) for Fluconazole, (100-0.19µg/ml) for IN and (200-0.39µg/ml) for GO , (32- 0.06 µg/ml) for Amphotricin B. Each test was carried out triplicate. Negative and positive control were considered.The cytotoxicity of nanocomposite was determined against intestinal epithelial cell line by MTT assay versus control group(without any treatment).

Results: our results indicated , Nanocomposite had strong inhibitory effect against *C.albicans* (MIC:3.12 µg/ml)compared to Indolicidin and GO alone .Also in concentration of 25 µg/ml it had candidacidal activity. Whereas this nanocomposite did not show any inhibitory effect on *Aspergillus* spp. (Table 1).The result of MTT indicated that GO/IN did not shown any cytotoxic effect on cell line and the viability of cells was more than 80 percent against control group.

Table 1.MIC and MFC of Nanocomposite against *C.albicans*

Substance	MIC (µg/ml)	MFC (µg/ml)
Flu	4	8
IN	12.5	50
GO	6.25	12.5
GO + IN	3.12	25

Conclusions: Designing the new drug delivery system via nanotechnology which is able to inhibit fungal growth , can be one of the drug delivery system objectives to improve treatment with minimum side effects. According our result , this nanocomposite with suitable MIC against *C.albicans* can introduce an appropriate component for inhibition candida growth . The integrity of Aspergillus cell wall may be explaining the resistance of *Aspergillus* to nanocomposite penetration. However , it would be beneficial to investigate the safety, and detailed mechanisms of this nanocomposite should be further studied in vitro and in vivo.