Antifungal Activity of a Wireless Electroceutical Dressing

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Background:
Fusarium and *Mucor* are two filamentous fungus strains that can cause infections in humans. *Fusarium* is known for causing corneal infections. Patients who have diabetes mellitus or are immunocompromised are at a higher risk of mucormycosis. Wireless electroceutical dressing (WED) contains embedded silver and zinc nanoparticles in a geometric pattern. Both zinc and silver have been known to be antimicrobial; yet the combination results in a weak electric field when exposed to an electrolyte-containing solution. WED has been found to have antifungal effects against *Candida albicans* and *Aspergillus fumigatus*.

Methods:
We investigated the antifungal effect of WED against *Fusarium* and *Mucor* growth and survival through daily radial growth and optic density readings.

Results:
Our results show that the WED weakly inhibits radial growth of *Fusarium* strains and strongly inhibits radial growth of Mucor strains, with greater inhibition near physiologic temperatures. Although zinc and silver-only fabric inhibited the radial growth of *Mucor*, no growth occurred on WED (Ag-Zn) plates for *Mucor* strains. Optic density readings had mixed results; Ag-Zn liquid cultures had reduced absorbance than control cultures for both strains. Zone of inhibition studies of *Fusarium* showed no growth on Ag-Zn fabrics with full coverage on all other control and metal containing plates. WED had a greater effect on reducing *Mucor* growth than *Fusarium*.

Conclusions:
WED utilizes a weak electrical field created by silver and zinc nanoparticles to create an antifungal effect. This leads to strong inhibition of *Mucor, Candida, and Aspergillus* growth and weak inhibition of *Fusarium* growth. Further studies are needed to determine the specific effect of WED on fungal viability, the mechanism, and *in vivo* efficacy. This work could increase patient treatment options for fungal wound infections.