**INTRODUCTION**

Limited attention has been given to the presence of fungi in the aquatic environment compared to other microorganisms such as bacteria and viruses. Our previous research showed that fungi occur widely in drinking water sources [1,2] and identified many fungi species that have not been previously reported in the aquatic environment. Moreover, many filamentous fungi species present in water were found to be able to grow at high temperatures and have conidia measurements lower than 5 µm, being therefore considered as potential pathogenic species to humans and animals [2].

Chlorine is the most widely used disinfectant in water treatment. However, *Penicillium* and *Aspergillus* species showed a higher resistance to free and combined chlorine disinfection than certain *Cladosporium* and *Phoma* species tested [3,4] and so may resist the conventional treatment. Further research is therefore needed to address the efficiency of different disinfectants for the inactivation of fungi. The use of UV for water treatment has increased over the years since it is extremely effective for inactivating protozoans, viruses and bacteria and does not require chemical addition. This will also decrease the chlorine dose needed as a final disinfectant in the distribution system and consequently, decrease the formation of chlorination disinfection by-products.

Light-emitting diodes (LED) recently emerged as a promising treatment technology due to their advantages: mercury free lamps, no stabilization time, long lifetimes, and diversity of wavelengths available. LEDs have already been used for the inactivation of several microorganisms in real water sources but, to the best of our knowledge, they have not been tested in terms of their ability to inactivate filamentous fungi in water. The aim of this study is therefore to evaluate: (i) the inactivation efficiencies of LEDs with different wavelengths (255 nm and 265 nm) on three *Aspergillus* species (*A. fumigatus*, *A. niger* and *A. terreus*) that were isolated from drinking water sources and; (ii) the effect of these light sources on their morphology, membrane permeability and enzymatic activity.

**METHODS**

### DISCUSSION and RESULTS

**Spores and mycelium grown for 7 days at 27 °C**

1x10⁶ spores/mL spiked into surface water matrix

**LED 255 nm and 265 nm**

0.5, 1, 5, 10, 15, 30, 45 and 60 min

**LED 255 nm**

**LED 265 nm**

**A. fumigatus**

**A. niger**

**A. terreus**

**UV Fluence**

Fungal inactivation

Growth Studies

Initial

After 3 weeks

**Karnovsky’s Fixative (overnight):**

- Glutaraldehyde (2.5 % v/v)
- Paraformaldehyde (2.0 % v/v)
- Phosphate saline solution (0.1 M)

**Osmium tetroxide (1.0 % v/v) for 2 hours**

**Dehydration with 30, 50, 70, 80, 90, 95 %, 5 min and 100 %, 10 min, of ethanol**

**Freeze dried for 30 min**

**Mounting samples on carbon conductive tape**

**Cover samples with gold and palladium**

**Scan Electron Microscopy**

**Flow Cytometry**

**Membrane permeability and enzymatic activity**

**SEM and Flow Cytometry proved to be suitable techniques to evaluate spores’ morphology, membrane integrity and enzymatic activity**

**CONCLUSIONS**

The LED that emits at 265 nm is more efficient to inactivate the fungi species; *A. niger* is the most resistant species.

The LED that emits at 265 nm has a higher effect on the membrane permeability and the enzymatic activity of the fungal spores

**Aspergillus niger** was the most resistance species which may also be due to its higher spores’ size and/or due to the presence of pigments

**Phenotypic effect**

**The LED that emits at 265 nm has a higher effect on the fungal spores morphology, regardless the fungi species**

**The LED that emits at 265 nm has a higher effect on the membrane permeability and the enzymatic activity of the fungal spores**

**A. niger** is the most resistant species followed by *A. fumigatus* and *A. terreus*

**REFERENCES**


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