Sensitization of glucose sensors as a pathway for increased uptake of methylene blue in *Candida albicans* with multidrug efflux systems

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Introduction

The field of antimicrobial therapies is constantly challenged by the phenomenon of microbial resistance and the emergence of emerging pathogens. Photodynamic therapy (PDT) is a new promising strategy to microbial inactivation based on the use of photosensitizer (PS) in the presence of oxygen and activation by light to form reactive oxygen species. Photoprocesses due to PDT are highly lethal to microbial cells, these are called Type I reactions - with formation of free radicals - and Type II reaction - with the formation of singlet oxygen. The accumulation of intracellular photosensitizer (PS) can be affected by the biofilm of *C. albicans* but the glucose sensor - SRR (sugar receptor-repressor), via glucose repressor and via adenylate cyclase – may be a pathway for better PDT performance.

Methods

Strains of *C. albicans* ATCC 10231, YEM 12, YEM 13, YEM 14 and YEM 15 were grown aerobically on Sabouraud agar and incubated at 30 ° C for 24 h. Microbial inoculants were divided into 4 groups with and without glucose: Control; Irradiation only; PS toxicity and PDT groups with 3-time irradiation. After going through the proposed treatments, the colony forming units were counted, converted and the data were submitted to statistical analysis (ANOVA) and Tukey's test. To verify the presence of MB in and out of the fungal cell, fluorescence spectroscopy and flow cytometry assays were performed.

Results

As super expressive strains of the Major Superfamily Facilitator had a greater ability to accumulate MB in their cytoplasm, however, as strains that overexpress ABC showed greater resistance to photooxidative stress.

Conclusion

PDT is an effective alternative in the inactivation of *C. albicans* and the glucose can affect the photodynamic effect. The MB present inside the cell increases photodynamic inactivation, however, its effect depends on the characteristics of the strain.

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