Interaction of Methylene Blue and Fluconazole on Photodynamic Therapy

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Background and objective. Combining PDT to conventional antimicrobial drugs may be a promising strategy to improve the antimicrobial efficiency promoted by each of the therapeutic modalities. Thereby the objective of this study was to investigate the interaction between fluconazole and methylene blue for application in photodynamic therapy.

Material and Methods. A methylene blue in water solution (25 μM or 100 μM) combined to 100 μg/mL fluconazole were exposed to LED radiation (λ=660 nm, 85 mW/cm^2, 1 to 8 min). The solutions were analyzed using a UV-VIS absorption spectrophotometer and a fluorescence spectrophotometer. The ROS production was indirectly estimated using 13.3 μM N,Ndimethyl-4-nitrosaniline (RNO) and 15 mM L-histidine. Following irradiation, ROS formation was determined by absorbance at 440 nm.

Results. The irradiation of MB solution promoted a reduction of absorbance of MB leuco band (292 nm), MB dimer band (610 nm) and MB monomer band (664 nm). Similar behavior was observed in MB+FLU solution, whereas no alterations were observed in FLU solution. Loss of absorbance at 292 nm and 664 nm, after 8 min of irradiation was 18% for both MB and MB+FLU solution.

MB fluorescence also reduced in function of irradiation time in both MB and MB+FLU solution. The signal intensity at 690 nm reduced 20% after 8 min of irradiation.

RNO degradation showed similar ROS production in MB solution with and without FLU.

Table 1. ROS production in MB and MB+FLU solutions determined by absorbance at 440 nm

Irradiation time	MB (SD)	MB+FLU (SD)
0 min	0.45 (0.01)	0.45 (0.01)
1 min	0.33 (0.01)	0.34 (0.01)
2 min	0.23 (0.02)	0.22 (0.02)
4 min	0.12 (0.01)	0.13 (0.01)
8 min	0.11 (0.01)	0.11 (0.01)

Conclusion. Irradiation of MB solution promoted loss of absorbance and fluconazole association did not alter this characteristic. Fluconazole did not affect ROS generated following methylene blue irradiation.

References

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