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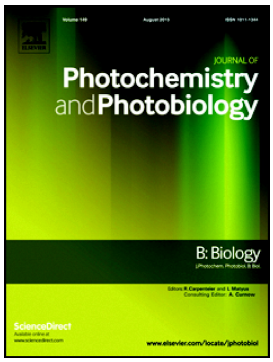

Singlet oxygen luminescence kinetics under PDI relevant conditions of pathogenic dermatophytes and molds

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Singlet oxygen luminescence kinetics under PDI relevant conditions of pathogenic dermatophytes and molds

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Abstract:

A treatment of onychomycosis using the photodynamic effect would be a favorable alternative to currently used antimycotic drugs. This study should be considered as a first step towards development and control of an efficient photodynamic inactivation of onychomycosis causative pathogens. Here, we evaluate the usage of time-resolved 2D singlet oxygen luminescence detection in combination with 2D fluorescence scanning as a tool to understand the behavior of the photosensitizer when applied to fungi on Petri dishes. To investigate the interaction of photosensitizer with fungi in various concentrations and in different stages of live, a photodynamic inactivation was avoided by keeping the samples in darkness. Scans of singlet oxygen luminescence and photosensitizer fluorescence were performed over a period of 24 days. Two different photosensitizer, a cationic porphyrin and cationic corrole and two fungi strains, the dermatophyte *Trichophyton rubrum* and the mold *Scopulariopsis brevicaulis*, were investigated in this study. The two-dimensional correlation of photosensitizer fluorescence and singlet oxygen luminescence revealed differences in the diffusion of both photosensitizer. Even though the singlet oxygen luminescence was quenched with increasing growth of fungi, it was found that the kinetics of singlet oxygen luminescence could be detected on Petri dishes for both photosensitizers and both fungi strains for up to seven days.

Keywords:

Photodynamic Therapy, Photodynamic Inactivation of Microorganisms, Onychomycosis, *Trichophyton rubrum*, *Scopulariopsis brevicaulis*, Singlet Oxygen.

Introduction:

Onychomycosis is a fungal infectious disease of human nails. The nail infection is caused primarily by dermatophytes followed by non-dermatophytic mold fungi and bacteria. Dermatophytes are able to invade keratinous structures like nails because of their ability to metabolize keratin (1). The main causative pathogens of onychomycosis are *Trichophyton rubrum*, *Trichophyton interdigitale* and less frequent molds like *Scopulariopsis brevicaulis* or *Aspergillus spp.* In most countries, *Trichophyton rubrum* is responsible for about 90% of cases, followed by *Trichophyton interdigitale* with 8%. (4) Because of frequent chronicity with relapses over years, onychomycosis is considered as a serious health problem with prevalence of 8.4% In Europe. (5) The treatment of onychomycosis often poses