Summary

Photodynamic antimicrobial therapy

Background: Photodynamic antimicrobial therapy is proposed as a potential topical, noninvasive approach suitable for treatment of locally occuring infection. The fact that bacteria are becoming increasingly resistant to antibiotics and antiseptics has lead to an increased interest in the field of developing new alternative eradication methods, such as PACT. Whereas gram-positive bacteria are generally sensitive to photoinactivation, gram-negative bacteria and fungi are usually less susceptible. Research of photosensitizers (PS) as well as development has been going on with the aim to find effective antimicrobial substances, which would have a broad-spectrum potency. The aim of this paper is to evaluate the antibacterial and antifungal effect of fifteen Pc derivatives.

Methods: Fifteen different Pc were investigated. Their photokilling activity was tested on *Staphylococcus aureus, Escherichia coli* and *Candida albicans*. After treating of microbial cells with Pc in the concentrations: 1 mg/l, 2 mg/l, 4 mg/l, 8 mg/l for 30 minutes, the cultures were irradiated with low-power laser light wavelength of 670 nm (20 J/cm^2, 40 J/cm^2). The effectiveness of photoinactivation was evaluated based on the decrease of a number ($\log_{10}$) of viable bacteria.

Results: Eight tested Pc showed antibacterial effect against *S. aureus*, but only four tested Pc were effective against *E. coli* and two Pc against *C. albicans*. Killing of bacterial and fungal strains was found to be dependent on the light dose. The most effective photosensitizers were amphiphilic sulphonated zinc Pc [(3-diethylammonium)-propylsulphonamide citrate (Pc3) and cationic tetramethylenepyridinium chloride of hydroxyaluminum Pc (Pc7). Only Pc7 was effective against another microbes tested.

Conclusion: The most efficient phthalocyanine - Pc7 causes a significant decrease of viable counts of all tested microbes and represent promising drug for potential use in the PACT of infectious disease.