The applicability of photodynamic inactivation of *Staphylococcus aureus* isolated from patients with atopic dermatitis.

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Atopic dermatitis (AD) is a chronically relapsing pruritic inflammatory skin disorder. The skin of AD patients exhibits a striking susceptibility to colonization and infection by *Staphylococcus aureus*, which may secrete various virulence factors, including staphylococcal enterotoxins (SEA, SEB, SEC, SED and others), SE-like toxins (SEl-J to SEl-U) and toxic shock syndrome toxin-1 (TSST-1). These toxins are superantigens (SAgs). SAgs are triggering large numbers of T-cells to produce massive amounts of inflammatory cytokines. Additionally, superantigens can penetrate the skin barrier and contribute to exacerbation of skin inflammation in patients with AD.

Photodynamic inactivation (PDI) is an alternative tool for antibacterial treatment particularly to eradicate drug resistant pathogens, such as *S. aureus*. This method is based on the use of visible light and nontoxic chemicals agent – photosensitizer (PS), which mutual action generates reactive oxygen species and singlet oxygen. Locally produces reactive oxygen species are able to destroy bacterial cell constituents, eg. proteins, lipids, nucleic acids.

The main aim of this project is to verify the efficiency of PDI against *Staphylococcus aureus* strains derived from patients with atopic dermatitis. The project starts with characterization of AD-derived *S. aureus* strains with respect to the presence and production of SAgs. Further we will investigate the possibility to modulate the production of SAgs in response to photooxidative stress generated as a result of PDI treatment. Finally, the mouse model of atopic dermatitis will be established, which will be colonized with SAgs producing *S. aureus*. The PDI treatment protocol will be verified in a mouse model of atopic dermatitis. In the future, our method could serve as an alternative tool for the skin desinfection of AD patients colonized with methicillin resistant *S. aureus*.

So far, we have gathered and characterized *S. aureus* strains from AD patients with respect to age, sex, CA/HA status, site of isolation and antibiotic resistance pattern. Fifty strains with various antibiotic resistance pattern were chosen for further investigation. Moreover, we applied photodynamic inactivation based on the use of rose bengal (4,5,6,7-tetrachloro-2′,4′,5′,7′-tetraiodofluorescein disodium salt) and grren light (λ_{max} = 514 nm). The presence of genes encoding for five superantigens (SEA, SEB, SEC, SED, TSST-1) was diagnosed.