EFFECT OF PHOTODYNAMIC INACTIVATION (PDI) USING RIBOFLAVIN OR RIBOFLAVIN CONJUGATED ANTIBODY AGAINST STAPHYLOCOCCUS AUREUS

N. Szentmary¹,², X. Song³, T. Stachon¹, J. Wang³, M. Bischoff³, A. Langenbacher⁴, E. Janunts⁴, B. Seitz¹

¹Department of Ophthalmology, Saarland University Medical Center, Germany
²Department of Ophthalmology, Semmelweis University, Hungary
³Institute for Microbiology and Hygiene, Saarland University Medical Center, Germany
⁴Experimental Ophthalmology, Saarland University, Germany

Purpose: Crosslinking/Riboflavin-UVA PDI is a potential treatment alternative in antibiotic resistant infectious keratitis. For PDI a specific (against bacteria) conjugated antibody may be used, to increase the effect of the treatment. We analysed the impact of PDI using riboflavin conjugated antibody or riboflavin alone on Staphylococcus aureus, in vitro. Methods: Staphylococcus aureus (S. aureus) was incubated in 1:100 diluted riboflavin conjugated antibody (R-AK) for 30 minutes in darkness. Following UVA-light-illumination (375 nm) with an energy dose of 2, 3, 4 and 8 J/cm², bacteria were brought to Blood Agar Plates for 24 hours before Colony Forming Unit (CFU) counting. In an additional group, we incubated bacteria to 0%, 0.05% or 0.1% riboflavin-5-phosphat as described above followed by illumination using UVA light (375 nm) with an energy dose of 2 J/cm², before CFU counting. Results: The number of CFU decreased significantly (p=0.022)(inactivation of 36%) using 1:100 diluted riboflavin conjugated antibody and 2 J/cm² UVA-light-illumination, compared to untreated controls. The use of 3, 4 und 8 J/cm² energy dose and R-AK in 1:100 dilution did not further change the decrease of CFU (p=0.016; p=0.016; p=0.015)(inactivation of 39, 39 and 40%).The use of 0.05% or 0.1% riboflavin-5-phosphat alone and UVA-light illumination reduced CFU count significantly(p=0.002; p=0.005)(inactivation of 73 and 55%), compared to untreated controls. Conclusions: The use of riboflavin conjugated antibody or 0.05 or 0.1% riboflavin-5-phosphat and UVA-light illumination reduces the number of CFU of Staphylococcus aureus. However, none of these photodynamic therapies reach the necessary 99% killing-rate of these bacteria.