

A new trend against Superbugs: The Photodynamic Principle

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Place: IFB UG&MUG (Lecture hall B)

Abstract:

Antimicrobial resistance is a serious threat to public health in Europe, leading to mounting healthcare costs, treatment failure, and deaths. The Infectious Diseases Society of America (IDSA) highlights that over the past several years, the number of new antibacterial drugs approved continues to decrease. Bacteria are very good in developing resistance against antibiotics in a short time. The leading bacteria are *Enterococcus faecium*, *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Acinetobacter baumannii*, *Pseudomonas aeruginosa* and *Enterobacter* species which are called the “ESKAPE” pathogens or superbugs, because they currently cause the majority of hospital infections and therefore effectively “escape” the effects of antibiotics. Therefore new approaches like photodynamic inactivation of bacteria (PIB) will become more important in the future as antimicrobial resistance is expected to continue to increase. This lecture gives a snapshot about the antibiotic resistance threats worldwide. Secondly this lecture summarises the potential candidates of new photosensitizers which are useful for PIB. Thirdly several applications possibilities of PIB will be discussed: Decolonisation of skin by PIB, wound healing, PIB in dentistry, and photodynamic active surfaces.

PD Dr. Tim Maisch (Ph. D.)

Tim Maisch studied Biology at the University of Erlangen-Nuremberg, Germany. He gained extensive laboratory experience working under the guidance of Prof. Dr. M. Mach at the Institute of Clinical and Molecular Virology, Univ. of Erlangen-Nuremberg. In 1997 he received his diploma and achieved his Ph.D. with a thesis titled "Upregulation of protein expression on endothelial cells infected with human cytomegalovirus" in 2001. Since 2002, he has been working as postdoctoral fellow at the Department of Dermatology, University Hospital of Regensburg on photodynamic inactivation of multi-resistant bacteria. He gained his Postdoctoral Habilitation in 2009 (*venia legendi*). Since 2008, he is the head of the laboratory of the Department of Dermatology. Currently he is the laboratory head of the Antimicrobial Photodynamic and Cold Plasma Research Unit at the Department of Dermatology, University Hospital Regensburg.

Main objectives of his research interests are:

- Investigation of the role of singlet oxygen and oxygen consumption in photodynamic inactivation of bacteria as well as the detection of singlet oxygen directly by its luminescence
- Development of new photosensitizers for the photodynamic treatment of bacterial and fungal infections in cooperation with the Department of Organic Chemistry, University of Regensburg
- Preclinical evaluation of new photosensitizers for topical application in dentistry and dermatology
- Development of photodynamic active surfaces to prevent contamination with microorganisms
- Application of cold atmospheric plasma against microorganisms in cooperation with the Max-Planck-Institute for Extraterrestrial Physics (MPE)

Research awards

- 3/2012 Award for best poster presentation during the **39. ADF-Annual Conference**, Marburg (01.03.-03.03.2012) mit dem „Photodynamic killing of enterohaemorrhagic Escherichia coli (EHEC) for the first time using TMPyP“
- 3/2008 **Arnold-Rikli-Award** to support photo-biological research interests of light in relation to human medicine in the future
- 11/2006 **PDT-2006 Award** to support the research interest in photodynamic therapy and fluorescence diagnosis of skin diseases
- 3/2006 Award for best poster presentation during the **33. ADF-Annual Conference, Aachen** (23.03. – 25.03.2006) “Investigation of photodynamic inactivation of bacteria using the detection of singlet oxygen luminescence”

Affiliations

- American Society for Microbiology (ASM)
- European Society for Photobiology (ESP)

Until now he has 50 publications in peer-reviewed journals and he is associate editor of the journal Photochemistry & Photobiology Sciences and a member of the editorial board of Anti-Infective Agents in Medicinal Chemistry.