Investigation of the antiseptic efficacy on *in vitro* biofilms of tissue tolerable plasma combined with common antiseptic solutions

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Therapies of chronically infected wounds in human and veterinary medicine are often complicated because of biofilm enveloped microorganisms, drugs resistant microorganisms or antiseptics. Especially the biofilm protects the microbial colonization against a complete inactivation by chemical substances [1]. Therefore "cold" plasma under atmospheric conditions could be an alternative or supplement to conventional therapies if the plasma does not damage the tissue irreversible. Physical plasma has an unspecific effect against all bacteria according to current knowledge and was often tested against "planktonic" and sessile biofilm bacteria [2] [3]. In addition, some plasma sources tested on cell culture or on living tissue showed tissue tolerable properties or supported the reorganisation of skin [4] [5].
Plasma irritates and damages microbial membranes and induces changes in cell permeability. The hypothesis is that plasma promotes the penetration of antiseptics in deeper layers of biofilms even for short exposure time. Moreover, bacteria are stressed by plasma produced reactive species that sensitise bacteria against antiseptics, too. Thus, a synergistic effect of plasma and antiseptic was expected. That could open up a completely new strategy for chronically infected wound healing therapies.
For that study, the „PlasmaJet", *kinpen09*® (1.1 MHz, 2-6 kVpp) with the working gas argon was used [6]. The *kinpen09*® is a tissue tolerable plasma (TTP) source [4]. The used antiseptic solutions were Octenidine, Chlorhexidine and Polihexanide which are used for wound infections or biofilm treatment. The bacteria *Pseudomonas aeruginosa* und *Staphylococcus aureus* were used for cultured biofilms since they are often involved in chronic wound healing processes [7]. The biofilm was cultured in microtiter plates for 48 h. The TTP was applied before and after chemical antiseptic treatment to compare the chronological order with the treatment of TTP and antiseptic solutions alone.

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