

Plasma meets Dermatology: Clinical aspects in preventive and curative Medicine

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Cold plasma has moved to a promising new treatment tool in medicine and especially in dermatology many applications seem realistic. Up to now superficial treatment is the dominating application mode of cold plasma opening a wide area of treatments on skin targeting epidermal and dermal disorders.

In relation to its distinct ways of action the plasma treatments can be separated into four sections, i) treatment of superficial skin and soft tissue infections ii) treatment of skin contamination and colonization iii) treatment of immunologic disorders and iv) tumor treatment.

The most important clinical indications of cold plasma in category i) are superficial and deep-seated dermal staphylococcal and streptococcal infections, but also parasitic and viral infections (warts) can be treated. Single but also multiple lesions like akne vulgaris can be effectively treated. To predict the plasma effect and the corresponding exposure time before treatment, susceptibility data of all relevant bacterial and fungal species are kept available in a reference data collection with continuous extension. A special goal in plasma therapy is the treatment of tinea and onychomycosis. The category ii) includes the eradication of pathogenic flora like MRSA and other multiresistant pathogens and constitutes a growing relevant factor in preventive medicine. It could be shown that plasma but not conventional antisepsis was able to decontaminate heavily colonized patient skin with MRSA and *Pseudomonas*. Additionally, cold plasma was shown to disinfect palmar skin in hand hygiene albeit time consuming and therefore not yet competitive to conventional antisepsis. Plasma susceptibility testing of most important clinical species showed excellent performance data and range cold plasma on the level of topical chemotherapy and antisepsis including environmental decontamination i.e. of fungal hyphae and spores. Category iii) includes treatments of diseased skin exhibiting vascular, skin barrier and connective tissue involvement. Cold plasma showed effectiveness in the therapy of psoriatic and sclerotic lesions. Category iv) involves plasma treatment of benign and malignant dermal tumors, like melanoma. In a mouse model plasma exhibits strong potency to destruct melanoma, to inhibit tumor cell spreading and to improve survival. Plasma can act synergistically to bioelectric therapy in curative and palliative tumor management.

This project is part of a joint research project supported by the *German Federal Ministry of Education and Research* (grant no. 13N9773 and 13N9779).