

Literatur zum Artikel

Kaltes physikalisches Plasma zur Behandlung von schlecht heilenden Wunden

1. Stalder KR, McMillen DF, Woloszko J (2005) Electrosurgical plasmas. *J Phys D: Appl Phys* 38: 1728–1738
2. Raiser J, Zenker M (2006) Argon plasma coagulation for open surgical and endoscopic applications: state of the art. *J Phys D: Appl Phys* 39: 3520–3523
3. Suchentrunk R, Staudigl G, Jinke D, et al (1997) Industrial applications for plasma processes – examples and trends. *Surf Coat Technol* 97: 1–9
4. d’Agostino R, Favia P, Oehr C, et al (2005) Low-temperature plasma processing of materials: past, present, and future. *Plasma Process Polym* 2: 7–15
5. Stoffels E, Sakiyama Y, Graves DB (2008) Cold atmospheric plasma: charged species and their interaction with cells and tissues. *IEEE Trans Plasma Sci* 36: 1441–1457
6. Fridman G, Friedman G, Gutsol A, et al (2008) Applied plasma medicine. *Plasma Process Polym* 5: 502–533
7. Dobrynin D, Fridman G, Friedman G, et al (2009) Physical and biological mechanisms of direct plasma interaction with living tissue. *New J Phys* 11: 115020
8. Weltmann K-D, Kindel E, von Woedtke Th, et al (2010) Atmospheric-pressure plasma sources: prospective tools for plasma medicine. *Pure Appl Chem* 82: 1223–1237
9. Park GY, Park SJ, Choi MY, et al (2012) Atmospheric pressure plasma sources for biomedical applications. *Plasma Sources Sci Technol* 21: 043001
10. Isbary G, Shimizu T, Li Y-F, et al (2013) Cold atmospheric plasma devices for medical issues. *Expert Rev Med Dev* 10: 367–377
11. von Woedtke Th, Reuter S, Masur K, et al (2013) Plasmas for medicine. *Phys Rep* 530: 291–320
12. Maisch T, Shimizu T, Li Y-F, et al (2012) Decolonisation of MRSA, *S. aureus* and *E. coli* by cold-atmospheric plasma using a porcine skin model in vitro. *PLoS One* 7: e34610
13. Daeschlein G, Napp M, von Podewils S, et al (2014) In vitro susceptibility of multidrug resistant skin and wound pathogens against low temperature atmospheric pressure plasma jet (APPJ) and dielectric barrier discharge plasma (DBD). *Plasma Process Polym* 11: 175–183
14. Haertel B, von Woedtke Th, Weltmann K-D, et al (2014) Physical plasma – possible application in wound healing. *Biomol Ther* 22: 477–490
15. Schlegel J, Köritzer J, Boxhammer V (2013) Plasma in cancer treatment. *Clin Plasma Med* 1(2): 2–7
16. Ratovitski EA, Cheng X, Yan D, et al (2014) M anti-cancer therapies of 21st century: novel approach to treat human cancers using cold atmospheric plasma. *Plasma Process Polym* 11: 1128–1137
17. Lloyd G, Friedman G, Jafri S, et al (2010) Gas plasma. Medical uses and developments in wound care. *Plasma Process Polym* 7: 194–211
18. Daeschlein G, Scholz S, Ahmed R, et al (2012) Skin decontamination by low-temperature atmospheric pressure plasma jet and dielectric barrier discharge plasma. *J Hosp Infect* 81: 177–183
19. Emmert S, Isbary G, Kluschke F, et al (2013) Clinical plasma medicine – position and perspectives in 2012. Paper of consent, result of the workshop “Clinical Concepts in Plasma Medicine”, Greifswald, April 28, 2012. *Clin Plasma Med* 1: 3–4
20. Julák J, Scholtz V (2013) Decontamination of human skin by low-temperature plasma produced by cometary discharge. *Clin Plasma Med* 1(2): 31–34
21. Isbary G, Morfill G, Schmidt HU, et al (2010) A first prospective randomized controlled trial to decrease bacterial load using cold atmospheric argon plasma on chronic wounds in patients. *Br J Dermatol* 163: 78–82
22. Isbary G, Heinlin J, Shimizu T, et al (2012) Successful and safe use of 2 min cold atmospheric argon plasma in chronic wounds: results of a randomized controlled trial. *Br J Dermatol* 167: 404–410
23. Isbary G, Zimmermann JL, Shimizu T, et al (2013) Non-thermal plasma – more than five years of clinical experience. *Clin Plasma Med* 1: 19–23
24. Klebes M, Ulrich C, Kluschke F, et al (2015) Combined antibacterial effects of tissue-tolerable plasma and a modern conventional liquid antiseptic on chronic wound treatment. *J Biophotonics* 8: 382–391
25. Isbary G, Stolz W, Shimizu T, et al (2013) Cold atmospheric argon plasma treatment may accelerate wound healing in chronic wounds: Results of an open retrospective randomized controlled study in vivo. *Clin Plasma Med* 1(2): 25–30
26. Ulrich C, Kluschke F, Patzelt A, et al (2015) Clinical use of cold atmospheric pressure argon plasma in chronic leg ulcers: a pilot study. *J Wound Care* 24: 196–203
27. Brehmer F, Haenssle HA, Daeschlein G, et al (2015) Alleviation of chronic venous leg ulcers with a hand-held dielectric barrier discharge plasma generator (PlasmaDerm® VU-2010): results of a monocentric, two-armed, open, prospective, randomized and controlled trial (NCT01415622). *JEADV* 29: 148–155
28. Chuangsuwanich A, Assadamongkol T, Boonyawan D (2016) The healing effect of low-temperature atmospheric-pressure plasma in pressure ulcer: A randomized controlled trial. *Int J Lower Extrem Wounds* 15: 313–319
29. Weltmann K-D, Kindel E, Brandenburg R, et al (2009) Atmospheric pressure plasma jet for medical therapy: plasma parameters and risk estimation. *Contrib Plasma Phys* 49: 631–640
30. Bekeschus S, Schmidt A, Weltmann K-D, et al (2016) The plasma jet kINPen – a powerful tool for wound healing. *Clin Plasma Med* 4: 19–28
31. Nosenko T, Shimizu T, Morfill GE (2009) Designing plasmas for chronic wound disinfection. *New J Phys* 11: 115013
32. Kuchenbecker M, Bibinov N, Kaemling A, et al (2009) Characterization of DBD plasma source for biomedical applications. *J Phys D: Appl Phys* 42: 045212
33. Karrer S, Arndt S (2015) Plasmamedizin in der Dermatologie. Wirkmechanismen und Anwendungsmöglichkeiten. *Hautarzt* 66: 819–828
34. von Woedtke Th, Metelmann HR, Weltmann K-D (2014) Clinical plasma medicine: state and perspectives of in vivo application of cold atmospheric plasma. *Contrib Plasma Phys* 54: 104–117
35. Graves DB (2012) The emerging role of reactive oxygen and nitrogen species in redox biology and some implications for plasma applications to medicine and biology. *J Phys D: Appl Phys* 45: 263001
36. Graves DB (2014) Oxy-nitroso shielding burst model of cold atmospheric plasma therapeutics. *Clin Plasma Med* 2: 38–49
37. Dröge W (2002) Free radicals in the physiological control of cell function. *Physiol Rev* 82: 47–95
38. Bekeschus S, von Woedtke Th, Kramer A, et al (2013) Cold physical plasma treatment alters redox balance in human immune cells. *Plasma Med* 3: 267–278
39. Schmidt A, Wende K, Bekeschus S, et al (2013) Non-thermal plasma treatment is associated with changes in transcriptome of human epithelial skin cells. *Free Radical Res* 47: 577–592
40. Wende K, Straßenburg S, Haertel B, et al (2014) Atmospheric pressure plasma jet treatment evokes transient oxidative stress in HaCaT keratinocytes and influences cell physiology. *Cell Biol Int* 38: 412–425
41. Schmidt A, Dietrich S, Steuer A, et al (2015) Non-thermal plasma activates human keratinocytes by stimulation of antioxidant and phase II pathways. *J Biol Chem* 290: 6731–6750
42. Bekeschus S, Schmidt A, Bethge L, et al (2016) Redox stimulation of human THP-1 monocytes in response to cold physical plasma. *Oxid Med Cell Longev*: 5910659
43. Boxhammer V, Li YF, Köritzer J, et al (2013) Investigation of the mutagenic potential of cold atmospheric plasma at bactericidal dosages. *Mutat Res-Genet Toxicol Environ Mutagen* 753: 23–28
44. Wende K, Bekeschus S, Schmidt A, et al (2016) Risk assessment of a cold argon plasma jet in respect to its mutagenicity. *Mutat Res-Genet Toxicol Environ Mutagen* 798: 48–54

45. Kluge S, Bekeschus S, Bender C, et al (2016) Investigating the mutagenicity of a cold argon-plasma jet in an HET-MN model. *PLoS One* 11: e160667
46. Metelmann HR, Vu TT, Do HT, et al (2013) Scar formation of laser skin lesions after cold atmospheric pressure plasma (CAP) treatment: A clinical long term observation. *Clin Plasma Med* 1: 30–35
47. Hasse S, Hahn O, Kindler S, et al (2014) Atmospheric pressure plasma jet application on human oral mucosa modulates tissue regeneration. *Plasma Med* 4: 117–129
48. Hasse S, Tran T, Hahn O, et al (2016) Induction of proliferation of basal epidermal keratinocytes by cold atmospheric pressure plasma. *Clin Exp Dermatol* 41: 202–209
49. Kalghatgi S, Friedman G, Fridman A, et al (2010) Endothelial cell proliferation is enhanced by low dose non-thermal plasma through fibroblast growth factor-2 release. *Ann Biomed Eng* 38: 748–757
50. Barton A, Wende K, Bundscherer L, et al (2013) Nonthermal plasma increases expression of wound healing related genes in a keratinocyte cell line. *Plasma Med* 3: 125–136
51. Schmidt A, von Woedtke Th, Weltmann KD, et al (2013) Identification of the molecular basis of non-thermal plasma-induced changes in human keratinocytes. *Plasma Med* 3: 15–25
52. Bundscherer L, Wende K, Ottmüller K, et al (2013) Impact of non-thermal plasma treatment on MAPK signaling pathways of human immune cell lines. *Immunobiology* 218: 1248–1255
53. Bundscherer L, Nagel S, Hasse S, et al (2015) Non-thermal plasma treatment induces MAPK signaling in human monocytes. *Open Chem* 13: 606–613
54. Lendeckel D, Eymann C, Emicke P, et al (2015) Proteomic changes of tissue-tolerable plasma treated airway epithelial cells and their relation to wound healing. *BioMed Res Int*: 06059
55. Nastuta AV, Topala I, Grigoras C, et al (2011) Stimulation of wound healing by helium atmospheric plasma treatment. *J Phys D: Appl Phys* 44: 105204
56. García-Alcantra E, López-Callejas R, Morales-Ramírez PR, et al (2013) Accelerated mice skin acute wound healing in vivo by combined treatment of argon and helium plasma needle. *Arch Med Res* 44: 169–177
57. Ngo Thi M-H, Shao P-L, Liao J-D, et al (2014) Enhancement of angiogenesis and epithelialization process in mice with burn wounds through ROS/RNS signals generated by non-thermal N₂/Ar micro-plasma. *Plasma Process Polym* 11: 1076–1088
58. Schmidt A, Bekeschus S, Wende K, et al (2017) A cold plasma jet accelerates wound healing in a murine model of full-thickness skin wounds. *Exp Dermatol* 26: 156–162
59. Metelmann H-R, von Woedtke Th, Bussiahn R, et al (2012) Experimental recovery of CO₂-laser skin lesions by plasma stimulation. *Am J Cosmetic Surg* 29: 52–56
60. Vandersee S, Richter H, Lademann J, et al (2014) Laser scanning microscopy as a means to assess the augmentation of tissue repair by exposition of wounds to tissue tolerable plasma. *Laser Phys Lett* 11: 115701
61. Heinlin J, Zimmermann JL, Zeman F, et al (2013) Randomized placebo-controlled human pilot study of cold atmospheric argon plasma on skin graft donor sites. *Wound Rep Reg* 21: 800–807
62. Hartwig S, Doll C, Voss JO, et al (2017) Treatment of wound healing disorders of radial forearm free flap donor sites using cold atmospheric plasma: a proof of concept. *J Oral Maxillofac Surg* 75: 429–435
63. Gay-Mimbrera J, García MC, Isla-Tejera B, et al (2016) Clinical and biological principles of cold atmospheric plasma application in skin cancer. *Adv Ther* 33: 894–909
64. Hirst AM, Frame FM, Arya M, et al (2016) Low temperature plasmas as emerging cancer therapeutics: the state of play and thoughts for the future. *Tumor Biol* 37: 7021–7031
65. Partecke LI, Evert K, Haugk J, et al (2012) Tissue Tolerable Plasma (TTP) induces apoptosis in pancreatic cancer cells in vitro and in vivo. *BMC Cancer* 12: 473
66. Schuster M, Seebauer C, Rutkowski R, et al (2016) Visible tumor surface response to physical plasma and apoptotic cell kill in head and neck cancer. *J Craniomaxillofac Surg* 44: 1445e–1452
67. von Woedtke Th, Metelmann H-R (2014) Editorial. *Clin Plasma Med* 2: 37
68. Metelmann H-R, Nedrelow DS, Seebauer C (2015) Head and neck cancer treatment and physical plasma. *Clin Plasma Med* 3: 17–23