Cold atmospheric pressure plasma (CAP): Effect on human lice and applicability for pediculosis treatment

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Every household can easily be struck by an infestation of head lice (Pediculus humanus capitis) regardless of its tidiness and personal hygiene. Especially, children and people spending a lot of time or are working in strongly populated environments are vulnerable to this infestation. When it comes to an infestation with head lice (Pedicuclus humanus capitis) most of the applied remedies available on the marked work with different insecticides such as lindane, malathion or permethrin. These are known to display toxic side and their provocation of resistances, as already build up by some populations. Results from different experiments concerned with possible and useful applications of CAP against pest insects led to the development of an alternative pediculosis treatment method based on the principle of a dielectric barrier discharge. This method can give non-toxic, insecticide-free and environmentally friendly alternative to existing pediculosis remedies. Based on a capacitively coupled setup, a comb-like electrode construction was chosen to ignite the plasma near to the scalp. To treat the complete volume of the hair, an electrode form was build that is not adapted to the heads contour, thus allowing the simultaneous treatment of scalp and hair in different distances from the scalp. We present the results of preliminary study conducted under controlled laboratory conditions. The presented experiments consider results of the treatment of adults, nymphs and eggs of Pediculus humanus bred by the German Environment Agency (Umweltbundesamt) in Berlin. The plasma comb was scoured through human hair strands infested with the lice stages at s/cm for one single transition. The treated lice were observed up to 48 h and eggs until 15 days after egg deposition. Furthermore, the efficacy was examined under ideal conditions by introducing single adult lice directly to the plasma exhibiting a mortality rate of 100% within 24 h. Observing the perishing process of the individuals under investigation it seems probable that the presumed mode of action is resulting mainly through presence of fast electric fields/dielectric heating.

Biography

Lars ten Bosch is pursuing his PhD at Clausthal University of Technology. His thesis is concerned with the possibilities that atmospheric pressure plasma is offering within the fields of plasma pest management and plasma agriculture, as well as plasma medicine. Currently, he is a project manager and research scientist for the main research: “Plasma based pest management in everyday life”. He has published one article, six poster presentations and two patents and has been serving as a reviewer for the American Chemical Society.

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