

LOW TEMPERATURE ATMOSPHERIC PRESSURE PLASMA APPLICATIONS IN DENTISTRY: TWO INDEPENDENT STUDIES*

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Introduction: Low temperature atmospheric pressure plasma (LTAPP) may be used for various biomedical applications as this technology has the potential to inactivate and destroy microorganisms^{1,2}. **Purpose:** The purpose of these two independent studies was to evaluate the efficacy of LTAPP on the inactivation of *Geobacillus stearothermophilus*, *Bacillus cereus* and *Streptococcus mutans*. The microorganisms of the study are of dental relevance. **Methods:** In Study 1, 981 samples were processed (762 experimental samples exposed to LTAPP, 219 control samples). Experimental samples of *G. stearothermophilus* and *B. cereus* (vegetative cells and spores) were exposed indirectly or directly to cold plasma at various time intervals for each microorganism state and type of exposure (indirect exposure time range: 1 minute-30 minutes; direct exposure time range: 30 seconds-30 minutes). In study 2, 90 samples were processed (72 experimental samples exposed to LTAPP, 18 control samples). Experimental samples of *S. mutans* were exposed directly to cold plasma for 60, 120, 180 or 300 seconds. In both studies: control samples were not exposed, colony forming units were counted, percentage kill/inactivation factor were determined and data were analyzed at 0.05 α significance. Analysis for study 1 included one-way ANOVA, Kruskal Wallis and Tukey's tests and study 2 used repeated measures ANOVA. **Results:** Study 1: Statistically significant reduction of *G. stearothermophilus* vegetative cells and *B. cereus* vegetative cells and spores (indirect and direct exposure p-values <0.025). There was no statistically significant reduction for *G. stearothermophilus* spores (indirect p=0.7208, direct p=0.0835). Study 2: Statistically significant reduction of *S. mutans* at all time exposures: 60 (p=0.0272), 120, 180 and 300 seconds (p=0.0001). **Conclusions:** Results demonstrate that LTAPP effectively kills *G. stearothermophilus* vegetative cells, *B. cereus* vegetative cells and spores and *S. mutans*. *G. stearothermophilus* spores were not significantly inactivated.

1. M Laroussi, Plasma Process. Polym. (Vol. 2), 2005, pp. 391-400.
2. G Fridman, AD Brooks, M Balasubramanian, A Fridman, A Gutsol, V N Vasilets, H Ayan, G Friedman, Plasma Process. Polym. (Vol. 4), 2007, pp. 370-375.

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