

# Could the addition of agents exceed anti-biofilm plasma efficacy?

I. Koban<sup>1</sup>, T. Kocher<sup>1</sup>

<sup>1</sup>Unit of Periodontology, Policlinics for Restorative Dentistry, Periodontology and Endodontology,  
Ernst-Moritz-Arndt University Greifswald, Germany

e-mail: ina.koban@uni-greifswald.de

## Résumé

The plasma effect against dental biofilms can be exceeded by the addition of some antimicrobial agents. Further research is necessary to specify these effects.

## Introduction

Dental biofilms play a major role in the pathogenesis of peri-mucositis. Biofilm removal is a prerequisite for a successful therapy of peri-implant lesions because it could inactivate biofilms [1]. In this study we evaluated the synergistic effect of six antimicrobial agents with atmospheric pressure plasma on three different dental biofilm models.

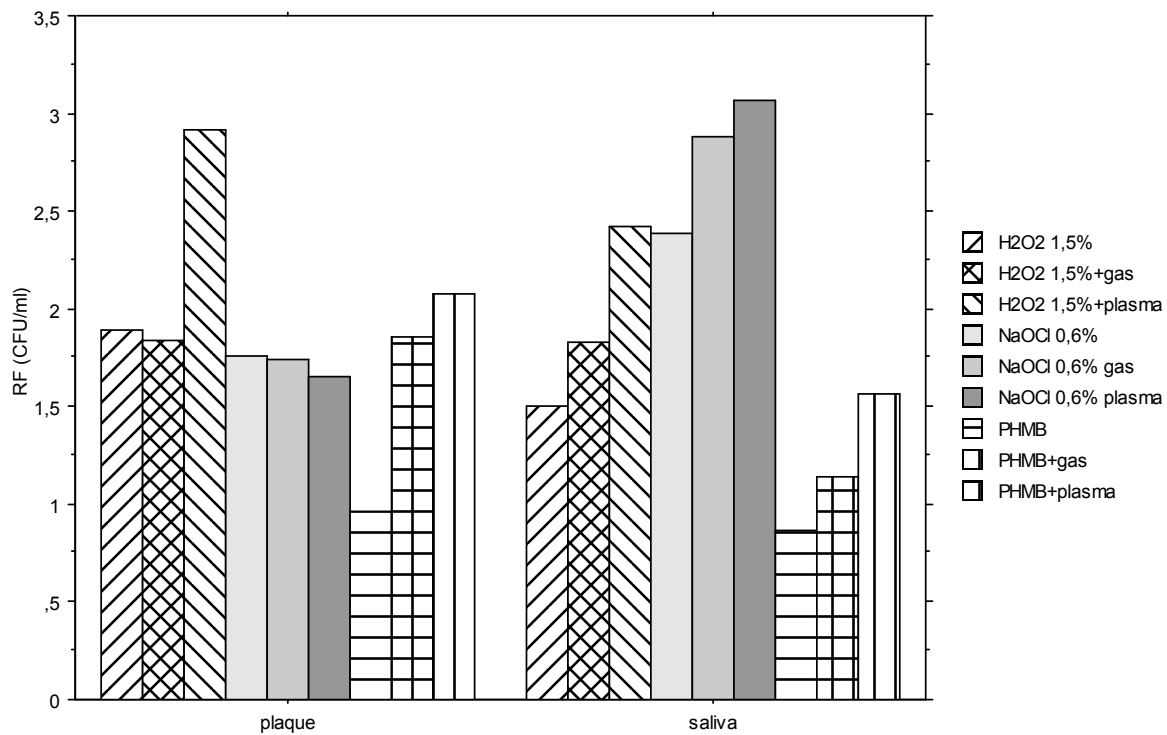
## Material and methods

We assessed the efficacy of kINPen09 argon plasma against monospecies *Streptococcus mutans* (*S. mutans*), multispecies aerobic human saliva and multispecies anaerobic plaque biofilm grown on titanium discs *in vitro* in comparison to argon gas. Efficacy of plasma treatment was determined by the number of colony forming units (CFU). The reduction factor (RF,  $CFU_{untreated} - CFU_{treated}$ ) was calculated.

## Results

The different biofilm models are differently sensitive to plasma and antimicrobial agents. Plasma showed the highest efficacy against plaque and *S. mutans* biofilms. EDTA+plasma exceeded the effects of plasma treatment in the case of saliva and *S. mutans*. The combination of H<sub>2</sub>O<sub>2</sub> and plasma obtained the highest reduction factor. Only in the case of saliva biofilm NaOCl+plasma was more effective than H<sub>2</sub>O<sub>2</sub>+plasma.

	plaque	saliva	<i>S. mutans</i>
gas	1,34	0,42	0,35
plasma	2,16	1,49	2,00
CHX	0,74	0,29	1,78
CHX+gas	1,84	1,38	1,95
CHX+plasma	2,00	1,70	1,95
Oct	1,54	0,79	1,84
Oct+gas	2,65	1,79	1,90
Oct+plasma	1,99	2,79	1,85
EDTA	1,74	0,64	1,11
EDTA+gas	2,02	0,73	1,27
EDTA+plasma	2,08	2,82	2,77



### Discussion and conclusion

The plasma effect can be exceeded by the addition of agents. Oxidants like  $H_2O_2$  and NaOCl have the highest effects in combination with plasma but these irrigants are toxic to the oral mucosa [2]. EDTA as a chelating agent could destabilize biofilms and showed a synergistic plasma effect, too without toxic effects to mucosa. Beside octinidine antiseptics could not exceed the pure plasma effect. However, further research is necessary to specify these effects.

### References

- [1] I. Koban, P. Matthes, N.O. Hübner, A. Welk, P. Meisel, B. Holtfreter, R. Sietmann, E. Kindel, K.D. Weltmann, A. Kramer, T. Kocher, *New J. Phys.* **12** (2010) 073039.
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