

Dental treatment using LF plasma jet with the reduced pH method -Disinfection of Dentin-

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In the dental treatment, the control of infectious microorganisms is very important, however, the methods for sterilization of infected dentine have not been established yet. In the present study, we evaluated the bactericidal effect of low frequency atmospheric pressure plasma jets with the reduced pH method [1] against oral pathogen including *Streptococcus mutans*, *Enterococcus faecalis* and *Candida albicans*, which are causes of dental caries and incurable root-canal infection. The results showed that the LF jet irradiation had bactericidal effects on oral pathogens in liquid with lower condition than pH4.5. As shown in Fig.1, after irradiation at pH 6.5, viable cells number was gradually reduced. On the other hands, no viable cells could be detected at pH 4.5 or 3.5, for 2 and 3 minute irradiation, and it was significantly different from the control ($p < 0.001$). For *E. faecalis*, the D values at pH 3.5, 4.5 and 6.5 were calculated to be 0.30, 0.47 and 2.00, respectively [2].

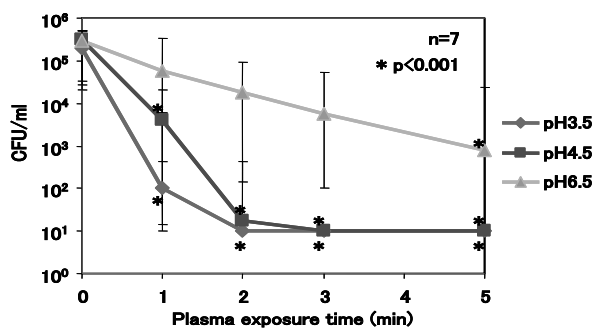


Fig. 1 CFU assay of *E. faecalis* in various pH solutions.

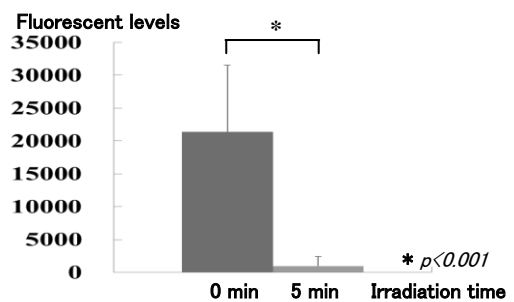


Fig 2. REDOX indicator assay after plasma irradiation on dentine infection models in the buffer of pH3.5

In the similar test using the infection model of hydroxyapatite pellets or dentine slice models, the significant bactericidal effect on *E. faecalis* was detected by metabolic REDOX indicator assay (Fig.2). With the infection model using human whole teeth, the enough bactericidal effect was gained with 2min irradiation. These results indicate that LF jets might be applied to the clinical dentistry.

References

- [1] S. Ikawa, K. Kitano, S. Hamaguchi, Plasma Process. Polym., 7, 1, pp.33, (2010).
- [2] H. Yamazaki, T. Ohshima, Y. Tsubota, H. Yamaguchi, A. Jayawardena, Y. Nishimura, Dent. Mater. J 30(3) : 384-391 (2011)