Plasma treated water with the reduced pH method for effective disinfection in dental and surgical treatment

Katsuhisa Kitano, Satoshi Ikawa\textsuperscript{a}, Atsushi Tani\textsuperscript{b}, Hiromitsu Yamazaki\textsuperscript{c}, Tomoko Oshshima\textsuperscript{a}, Emi Usui\textsuperscript{c}, Yasuko Momoï\textsuperscript{c}, Kazuhiro Kaneko\textsuperscript{d}, Masaaki Ito\textsuperscript{d}, Takeshi Kuwata\textsuperscript{d}, Atsushi Yagishita\textsuperscript{d}

Graduate School of Engineering, Osaka University, Suita, Osaka 565-0871, Japan
\textsuperscript{a} Technology Research Institute of Osaka Prefecture, Izumi, 594-1157, Japan
\textsuperscript{b} Graduate School of Science, Osaka University, Toyonaka, 560-0043, Japan
\textsuperscript{c} School of Dental Medicine, Tsurumi University., Yokohama, 230-8501, Japan
\textsuperscript{d} National Cancer Center Hospital East, Kashiwa, 277-8577, Japan

e-mail kitano@plasmabio.com

Atmospheric pressure plasma jet has been applied for disinfecting human bodies in dental and surgical therapies. Considering wet conditions of body fluid, sterilization experiments in solution have been conducted with low-temperature atmospheric-pressure plasmas. We have successfully developed the reduced pH method that strong bactericidal activity can be achieved when the solution is sufficiently acidic (Fig. 1) [1]. In addition, the plasma treated water has been found to have strong bactericidal activity for constant time which depends on water temperature. This type of indirect plasma exposure would bring safety plasma disinfection, because the selected supply of active species is possible.


![Fig. 1 Bacterial inactivation assay in various pH solutions as functions of plasma exposure time for \textit{Escherichia coli} suspension.](image-url)