

Application of atmospheric pressure plasma to microbial inactivation

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Plasma (ionized gas) has been applied to microbial inactivation and considered as a promising sterilization tool that may be able to offset detrimental effects of chemical sterilization. Many plasma devices developed in the laboratories have demonstrated to inactivate microbes very efficiently. However, it has been also found that plasma can generate different effects depending on microbial species and surrounding environment. In the study, we investigated microbial responses to plasma using two eukaryotic microbes (*Saccharomyces cerevisiae* and *Neurospora crassa*) in various environments. The viability and cell morphology of *S. cerevisiae* and *N. crassa* exposed to plasma were both significantly reduced depending on the exposure time when treated in water than in saline or nutrient media. Dramatic reduction in pH of water and saline after plasma exposure was observed but this might not be a main reason for microbial inactivation. We observed that direct plasma treatment always resulted in more severe effect on yeast cells and fungal spores than plasma treated and acidic water, indicating that factors directly from plasma may be mainly involved in microbial inactivation. Interestingly, we discovered that the transcription factor *tah-3* gene was involved in generating fungal tolerance to a harsh plasma environment.