Contribution ID: **885** Type: **Either**

3P65 - SURFACE DISCHARGE PLASMA INHIBITED THE BIOSYNTHESIS OF STAPHYLOXANTHIN IN STAPHYLOCOCCUS AUREUS

Wednesday 26 June 2019 13:30 (1h 30m)

In the recent years, atmospheric pressure surface discharge plasma as newly developed plasma source, becomes an ideal approach for the ROS/RNS generation and biomedical sample processing. Surface discharge plasma has exhibited excellent antibacterial activity against aggressive human pathogen Staphylococcus aureus (S. aureus), which could cause a wide spectrum of clinically significant hospital- and community-acquired infections in human. However, the mechanism of plasma sterilization against S. aureus is still not well understood. Staphyloxanthin, a yellowish-orange carotenoid pigment, is one of the most important virulence factors of S. aureus, which could not only act as an antioxidant to protect S. aureus from oxidative stress, but also enhance bacterial survival in harsh environments. Therefore, the effect of surface discharge plasma on the staphyloxanthin biosynthesis in S. aureus was investigated to further reveal the plasma sterilization mechanisms.

In this study, we used helium as the working gas, the cell suspension of S. aureus was treated by surface discharge plasma for different time. The bacterial cell viability after plasma exposure was evaluated by counting the colony forming units (CFU) assay, and further verified by LIVE/DEAD staining. Besides, the intracellular ROS level and the membrane potential were detected by fluorescent microscopy using 2',7'-dichlorofluorescein diacetate (DCFH-DA) and carbocyanine dye 3,3'-diethyloxa-carbocyanine iodide (DiOC2), respectively. Meanwhile, the integrity of the cell membrane was indicated by release of intracellular components, like DNA/RNA and protein, and further verified by SEM-EDX. Moreover, the yields of staphyloxanthin in S. aureus and the amount of singlet oxygen in solution were measured by high performance liquid chromatography (HPLC) method. In addition, the oxidation reduction potential (ORP) and pH of plasma-treated bacterial cell suspension were monitored by a multimeter pH & Redox.

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Session Classification: Poster - Industrial/Commercial/Medical Applications and Plasma and Pulse Power Diagnostics

Track Classification: 6.5 Medical and Biological Applications