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# Seminar

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## Institute for Plasma Research

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- Title:** Studies on Microbial Inactivation using Plasma Sterilization
- Speaker:** Dr. Tejalben Barkhade  
Institute for Plasma Research, Gandhinagar
- Date:** 04<sup>th</sup> October 2022 (Tuesday)
- Time:** 03:30 PM
- Venue:** Join the talk online:  
[https://lobby.ipr.res.in/PDF\\_extension\\_Talk\\_Dr\\_Tejal\\_Barkhade](https://lobby.ipr.res.in/PDF_extension_Talk_Dr_Tejal_Barkhade)

### Abstract

In recent years, plasma sterilization of micro-organisms has evoked keen interest among researchers. It has emerged as an alternative to “conventional” methods which have numerous drawbacks. Although plasma sterilization has attracted much attention, the underlying mechanisms and biochemical actions involved in the plasma treatment are still not fully understood. In this work, we investigate the inactivation of the micro-organisms *Staphylococcus aureus* (SA), *Salmonella abony* (SAb) and *Pseudomonas aeruginosa* (PA) by DC plasma. The inactivation is first measured in terms of the reduction in colony forming units (6-Log-CFU/ml). After 60 min, 40 min and 10 min of plasma exposure, zero colonies of SA, SAb and PA were found on nutrient agar media plates respectively. This clearly indicated 6-log reduction. Spectroscopic techniques like Spectrofluorometer, Circular Dichroism (CD) Spectrometer, and UV-Visible Spectrophotometer were then employed for in-depth understanding of bacterial inactivation. The generation of reactive oxygen species (ROS) on the bacterial membrane due to plasma exposure was studied. It was found that the amount of .OH and H<sub>2</sub>O<sub>2</sub> radicals increased after increase in the plasma exposure time, which resulted into oxidative stress in bacteria. This is considered to be the main cause of cell death. Several other interesting observations were made. For example, on one hand, the  $\alpha$ -helix membrane protein denaturation was observed with increase in the time of plasma exposure whereas, on the other hand, the DNA concentration of SA and SAb was decreased after plasma treatment. Above results provide new insights into the mechanisms leading to the destruction of bacteria due to different plasma processes.

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