

Online LTP Seminar

Lecture 5

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Plasma and the Immune System

Vandana Miller
Drexel University College of Medicine

Abstract: The immune system serves as the defense system of the body, protecting against infectious and non-infectious assaults via physico-chemical barriers and chemical modulators/effectors. Many of the chemical species produced by immune cells are also generated in cold plasmas. Therefore, cells have the capability of responding to these RONS and also neutralizing their effects. In this talk I will discuss the rationale behind using plasma to trigger immune cells to do plasma's "dirty job" for it. I will share data that shows how this approach works for treatment of cancers, in wound healing and also the potential for plasmamediated immune stimulation for treatment of infectious diseases like COVID-19. Limitations of and opportunities for clinical application of plasma will also be discussed.

Brief Bio

Dr. Vandana Miller, MD is an Associate Professor in the department of Microbiology and Immunology an at Drexel University College of Medicine. She spent several months as a visiting scientist at INP Greifswald and University of Bari, Italy in 2019. Until October 2018, she was the Director of the Plasma Medicine laboratory at the Nyheim Plasma Institute of Drexel University in Philadelphia, further developing newer applications in Plasma Medicine. At NPI, she spearheaded various biological projects including anti-microbial applications of plasma, plasma-assisted transdermal drug delivery, treatment of skin diseases and tissue regeneration, cancer, etc. with low temperature plasma.



She got her medical degree in India where she specialized in infectious diseases. Her education and training have given her a well-rounded perspective of both clinical and laboratory investigation of immune responses in infectious diseases. She worked with both *in vitro* and *in vivo* models of these diseases and gained expertise in cell biology, immunology, microbiology and molecular biology. At the University of the Sciences in Philadelphia from 2000-2013, she taught experimental and fundamental Microbiology and Immunology to Biology and D. Pharm students. Here, she worked with undergraduate and graduate students in collaboration with colleagues working in fields as diverse as inflammation, bioengineering of organisms, cellular stress responses, DNA damage responses, development of oral tolerance and natural products.

Her ongoing research focus is on harnessing the immunomodulatory capability of non-thermal plasma for applications in cancer treatment, wound healing, skin diseases, viral diseases and vaccine delivery. She works closely with tumor immunologists, surgeons, dermatologists, virologists and immunologists, and collaborates with plasma scientists and engineers all across the world.

She was also active in developing the use of plasma activated water for agriculture, in addressing microbial contamination of food during all stages of food processing and in identifying that plasma-enriched irrigation water with increased plant growth and fecundity thereby reducing the quantity of irrigation required for sustained growth.