Nonthermal Bioplasma Sources and its Application to the Microbial, Fungi, and Living Cells

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Abstract
We have investigated the nonthermal bioplasma sources and their interactions with microbial, fungi, yeast and living cells, especially to the blood immune cells. The diagnostic method for the hydroxyl radical density has been introduced from the bioplasma jet by the ultraviolet absorption spectroscopy. We report the electron temperature and density of bioplasma based on the collisional radiative model for application to the bacteria germicide caused by several reactive oxygen species in the atmospheric pressure. Herein, we have investigated the basic interactions of nonthermal dielectric-barrier discharge plasma with the Escherichia coli in morphological and biomolecular aspects under lethal dose. We have also investigated the influence of the nonthermal bioplasma on the SH-SY5Y neuronal cell proliferation and BV2 microglial cell death as well as the DNA damages. The pH of the blood plasma, the vitality of blood cells, and the cytokine production from white blood cells have been influenced by the bioplasma and their results will also be reported. We will report the effects of bioplasma on embryogenesis and regeneration of embryos without morphological defects. This work will contribute to the understanding of the exact biological pathways of plasma interaction with living organisms.

Biography of Speaker

Eun Ha Choi (M’96) was born in Inje, Korea, in 1960. He received the B.S. degree from Seoul National University, Seoul, Korea, in 1982, and the M.S. and Ph.D. degrees from the Korea Advanced Institute of Science and Technology, Seoul, Korea, in 1984 and 1987, respectively. From 1988 to 1989, he was with the Naval Surface Warfare Center, Silver Spring, MD, as a post doctorate where he worked on the magnetic conditioning of the intense electron beam, time resolved electron beam measurements, and high-power microwave generation from the cusptron device. From 1989 to 1990, he was an Assistant Professor/Contractor in the Department of Physics, Hampton University/NASA, Hampton, VA, where his research concern was the high-power inverse pinch plasma switch for the plasma thruster. From 1990 to 1992, he was a Senior Research Scientist at Korea Research Institute of Standards and Science, where he studied plasma diagnostics and plasma processing technology. Since 1992, he has been with Kwangwoon University, Seoul, Korea, where he is currently a Professor in the Department of Electrophysics. His current research fields are high-power charged particle beams and high power microwave generation from pulsed systems, plasma material processing, focused ion beam physics and technology, plasma display panels (PDPs), transparent conductive oxide films, and plasma biosciences. Since 1987, he has been a Chairman of the PDP Research Center, Kwangwoon University, Seoul, Korea. Also since 2010, he has been a chairman of the “Plasma Bioscience Research Center”, which is a Center of Excellency in SRC (Science Research Center) program, supported by Ministry of Education, Science and Technology of Korean Government.