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# Enhanced functional maturation of dendritic cells by exponential wave electric pulse application

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The development of specific adaptive immunity requires pathogen/tumor-specific antigen presentation to T cells by professional antigen-presenting cells (APCs). The most specialized APCs, known as Dendritic Cells (DCs), are critical for priming antigen-specific T cell responses. The antigen-presentation function of DCs strictly depends on functional maturation characterized by (a) high expression of MHC I/II and co-stimulatory molecules (CD40, CD80, and CD86) and (b) efficient antigen processing and presentation. The pathogens that cause Malaria, Tuberculosis, Flu, AIDS, cancer, and many other diseases suppress immune responses by inhibiting DC maturation leading to inefficient antigen processing, presentation, and dysfunctional CD8+ T cell priming. In the past several decades, many strategies have been developed to functionally mature and activate DCs in vivo. These strategies have included the use of adjuvants (substances that enhance immune response to antigens) such as Toll-like receptor (TLR) ligands (Lipid A, Poly [I:C], CpG etc.), cytokines, and immune-modulators. However, these approaches have had limited efficacy and have posed a risk of adverse immune responses. In this study we tested an innovative approach to enhance DC maturation and antigen-presenting function without the use of cytokines, LPS or TLR ligands. The central hypothesis of this study is that "Defined Exponential Pulse Electric Fields" (pEFs) delivered to skin and superficial lymph nodes can significantly enhance DC maturation and antigen-presenting function without inducing cell death, thus, triggering antigen-specific T cell priming and activation". The experimental data supporting this hypothesis will be discussed.

## Biography

Sunil Joshi is an outstanding young scientist, with an excellent education and background, and includes the unusual albeit valuable combination of a veterinary degree as well as a PhD degree. He is an established cellular immunologist and employing novel applications of bioelectrics in modulating innate immunity. Recently, he has established his own laboratory at the Frank Reidy Research Center for Bioelectrics which is newly created multidisciplinary advanced biomedical engineering center at Old Dominion University. His lab is also working to define molecular changes in the plasma membrane in response to various electrical functional waves. He employs multi-dimensional approaches to address key issues in vaccinology particularly vaccination against Malaria and Tuberculosis. He has been awarded Bill & Melinda Gates Foundation Grand Challenge Exploration award to work on use of Bioelectrics in vaccination.

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