OMICS Group Conferences
Accelerating Scientific Discovery

2nd International Conference on
Nanotek and Expo

December 3-5, 2012 DoubleTree by Hilton Philadelphia Center City, USA

A study of variation of macrophage polarization and antigen presentation by different size of antigen loaded PCL nanoparticle

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The goal of a successful vaccine is to generate a strong T cell response which depends on effective antigen presentation. The current study evaluated antigen presentation capability of two different size of poly-ε-caprolactone nanoparticles (PCLNP) with mean diameter of 60nm and 450 nm, loaded with two different antigens, mycobacterial early secreted antigenic target 6 (ESAT 6) and tetanus toxoid (TT). The human blood monocyte derived macrophages (hmoM) were used as antigen presenting cells and co-cultured with autologous CD4+ and CD8+ T cells for antigen presentation assay. The PCLNP was synthesized by solvent evaporation method and characterized by TEM and DLS. The internalization kinetics, degradation, toxicity, RBC hemolysis and ROS generation were studied *in vitro* which indicated a high biocompatibility of PCLNP. Following incubation with hmoM, void 60nm PCLNP showed a showed high IL12 and low IL10 in culture supernatant (M1 polarization), whereas 450nm PCLNP showed a low IL12 and high IL10 (M2 polarization). CD4+ T cells increased production of IFN gamma ($p<0.001$) in antigen presentation assays with both ESAT 6 and TT entrapped 60nm PCL NP (TH1 polarization), whereas increased IL4 and IL10 production ($p<0.05$) was noted with 450nm antigen entrapped PCL NP (TH2 polarization). With CD8 cells, ESAT-6 loaded NP enhanced production of IFN gamma and IL-12, while TT-loaded NP heightened IL-12 secretion ($p<0.05$). This study demonstrated the size dependant differential adjuvant property of PCL NP which may be utilized for development of more efficient vaccine with long lasting immune response modulating both T helper (CD4+) and cytotoxic (CD8+) T cells.

Biography

Amit Kumar Dinda is Professor of Pathology at All India Institute of Medical Sciences (AIIMS), New Delhi. He has done MBBS in Calcutta Medical College and completed his post-graduation in Pathology in 1986 at AIIMS. He did his PhD in the area of Cancer Biology at AIIMS. He is a faculty at AIIMS since 1993. His area of work includes Renal & Immunopathology, Cell Biology, Biomaterials, Tissue Engineering and Nanomedicine. He is in the editorial committee of 14 National-International journals. . He has published 218 articles in indexed journals, edited 4 books, written 14 chapters in books and acquired 4 patents.

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