The HBsAg loaded PLGA biodegradable nanoparticles have been successfully developed to improve the systemic action of vaccines. The particulate system like nanoparticles may be a better carrier system for immunization, because the surface modification creates greater entrapment of antigens with in the nanoparticles. HBsAg loaded nanoparticles have neither cell cytotoxicity nor interference in cell growth process. HBsAg NPs are also haemocompatible in nature and shows sustained release for longer period of time. It is a good carrier system for immunization and produce sustained antibody titre with better immunological potential. The humoral and cellular responses after the administration of HBsAg loaded PLGA nanoparticles without adjuvant at the single dose given higher activity in immunogenic BALB/c mice. A single injection of HBsAg loaded PLGA nanoparticles produce maximum responses and stay for longer period of time. When the prepared polymeric nanoparticles administered via different route like oral, sub-cutaneous, nasal and intra muscular, the intra muscular route have shown significantly stronger humoral and cellular immunological response in comparison with another routes. Moreover, HBsAg loaded PLGA nanoparticles administered by nasal route have shown approximately equivalent immune response but there is difficulty in administrating the nanoparticles through this route.

The prepared nanoparticle was further evaluated in developed humanized xenograft mice that suffer from chronic Hepatitis B virus. The development of a humanized model would allow us to study the immune response to HBV infection in an immunologically small animal host. The *in-vivo* humanized model is an extremely valuable tool for the study of new vaccine strategies for generation and detection of antigen-specific immunoglobulin G (IgG) secreting B cells and mitogen responsive interferon-*Y* secreting T cells. It showed stimulation of immune system after nanoparticles

vaccination. The model explains the exact viral clearance mechanism in cells. The successive virus-specific T cell response led to the eventual clearance of HBV by cytolytic and noncytolytic mechanisms. Mice model showed virus-specific CTL (Cytotoxic T Lymphocytes) response. The cytotoxic T Lymphocytes response is capable to remove virus and viral like particles. The developed mouse immune system is capable of influencing both modes of immune control system. After the nanoparticles vaccination the level of HBV has decreased.

Therefore, this antigen loaded PLGA nanoparticles based novel delivery approach system can be used for more traditional vaccines that would improve patient compliance and establish a highly qualitative as well as quantitative production of antibody against Hepatitis B virus. The single dose of HBsAg loaded nanoparticles produces higher immunoglobulin antibodies (IgG and IgA) and cytokines (IFN-*Y* and IL-2) for eight weeks in BALB/c mice in comparison to market vaccines which contains adjuvant for their efficiency. Thus, the prepared nanoparticles are sufficient for the curing of acute and chronic Hepatitis B virus infection without the need of booster dose.
